

ZOOM Protocols

- Please rename yourselves using your first name, last name, and organization (i.e., *Jane Doe – CCP*),
- All participants are asked to mute themselves
- If you have a question or want to make a comment, please insert it in the “Chat” or “Q&A” sections.
- If you are called on to speak, please mute your line following any questions/comments to reduce background noise
- Note: Meeting is being recorded

Manure Recycling and Innovative Products (MRIP) Task Force

March 2, 2026

California Department of Food and Agriculture



Welcome and Introductory Remarks

Ryan Flaherty

Sustainable Conservation

MRIP Co-Chair

Meeting Agenda

Recap of MRIP and Vision Moving Forward

Progress on MRIP Goals

Spotlight: Pilot Projects

MRIP-Relevant Regulatory Developments

MRIP-Relevant Research

Discussion: What Else is Needed to Identify and Scale Solutions for Surplus Manure?

Closing Remarks

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MRIP Goals

- **Increase the understanding** of the scale and distribution of nitrogen surplus on dairies and potential demand from other crops for nitrogen and other manure nutrients.
- **Identify research, technical and policy actions** that encourage innovations to recycle surplus nutrients for use in agriculture; creating a circular fertilizer/soil amendment economy that builds healthy soils, conserves and protects water, and makes our state's agriculture more sustainable.
- **Organize short, mid, and long-term potential solutions and create a roadmap** for continued progress, including estimates of time and resources necessary to achieve research, policy, technology development, and education/outreach objectives.

MRIP Members

Title	First	Last	Organization
Dr.	Rizaldo	Aldas	California Energy Commission
Mr.	Michael	Boccardo	Dairy Cares
Dr.	Martin	Burger	California Department of Food and Agriculture
Mr.	J.P.	Cativiela	Central Valley Dairy Representative Monitoring Program
Mr.	Scott	Couch	State Water Resources Control Board
Mr.	Ryan	Flaherty	Sustainable Conservation
Mr.	Justin	Gioletti	Robert Gioletti and Sons Dairy
Mr.	Matt	Harrison	California Air Resources Board
Mr.	Caleb	Harper	Dairy Management, Inc.
Dr.	Sean	Hurley	California Polytechnic University
Mr.	Kyle	Jones	Community Water Center
Dr.	Steven	Kaffka	University of California, Davis
Mr.	Chris	Kopman	Newtrient
Ms.	Manjeet	McCarthy	GoBiz
Ms.	Jennifer	Morales	California Department of Water Resources
Mr.	Ramon	Norman	San Joaquin Valley Air Pollution Control District
Mr.	Greg	Norris	Natural Resources Conservation Service
Mr.	Clay	Rodgers	Central Valley Regional Water Quality Control Board
Ms.	Renee	Pinel*	Western Plant Health Association
Ms.	Emily	Rooney*	Agricultural Council
Mr.	Paul	Sousa	Western United Dairies
Ms.	Sarah	Standiford	California Department of Food and Agriculture
Mr.	Aaron	Wickstrom	Wickstrom Dairies/Valsigna Farms

*Unable to participate after the first MRIP meeting on October 26, 2021, or participate in subsequent recommendation development, discussion, or polls.

MRIP Final Report

Recommendations Organized by Solution Type:

1. Conventional Strategies
2. Compost
3. Denitrification
4. Nutrient Capture and Treatment

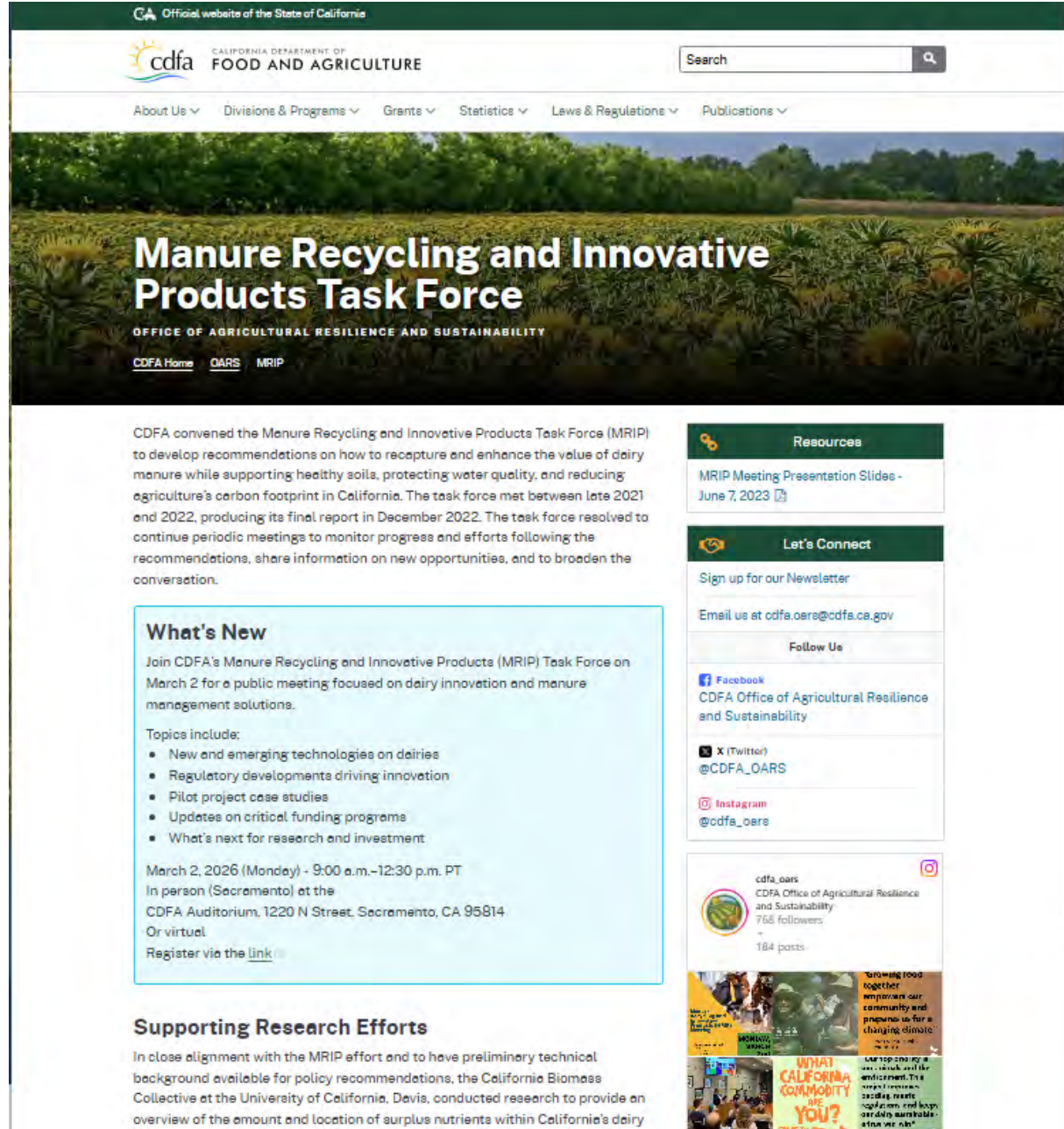
Why MRIP Remains Important

- Dairy industry remains under significant, growing pressure to improve water quality while reducing climate footprint
 - *Nitrate Control Program*
 - *Dairy General Order*
 - *High prices for fertilizer and other inputs*
- Innovations in manure management technology and practices continue to show promise for providing economic and environmental opportunities
- Collaboration across sectors is critical to seizing this opportunity

Purpose & Goals Going Forward

- Continue to serve as a forum where industry, policymakers, regulators, researchers, entrepreneurs and NGOs:
 - Share information on progress for known and new strategies
 - Discuss research needs
 - Make recommendations to improve business case (markets, incentives, financing options)
 - Address regulatory, permitting or other barriers
- Meet at least 1x per year, more as needed
- Your suggestions for informational topics and presentations welcome!
- Sign up for meeting notices at www.cdfa.ca.gov/oars/mrip

MRIP Website



The screenshot shows the homepage of the Manure Recycling and Innovative Products Task Force (MRIP) website. The header includes the California Department of Food and Agriculture logo and a search bar. The main navigation menu lists: About Us, Divisions & Programs, Grants, Statistics, Laws & Regulations, and Publications. The main banner features a field of crops with the title "Manure Recycling and Innovative Products Task Force" and the subtitle "OFFICE OF AGRICULTURAL RESILIENCE AND SUSTAINABILITY". Below the banner are links for "CDFA Home", "OARS", and "MRIP".

Resources

- [MRIP Meeting Presentation Slides - June 7, 2023](#)

Let's Connect

Sign up for our Newsletter

Email us at cdfa.oars@cdfa.ca.gov

Follow Us

- Facebook**
CDFA Office of Agricultural Resilience and Sustainability
- X (Twitter)**
[@CDFA_OARS](#)
- Instagram**
[@cdfa_oars](#)

cdfa_oars
CDFA Office of Agricultural Resilience and Sustainability
768 followers
184 posts

Supporting Research Efforts

In close alignment with the MRIP effort and to have preliminary technical background available for policy recommendations, the California Biomass Collective at the University of California, Davis, conducted research to provide an overview of the amount and location of surplus nutrients within California's dairy

www.cdfa.ca.gov/oars/mrip

Disclaimer

- Today and in future from time to time, we intend to invite private sector companies to present information on their progress and share their point of view
- This does not constitute an endorsement of any company or technology by CDFA or MRIP, and is for informational purposes only
- Any company who wishes to present at a future MRIP forum should contact the co-chairs to discuss

Meeting Agenda

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Conventional Strategies

1. Implement Summary Representative Monitoring Report (SRMR) reporting structure
2. Increase industry and extension/training programs to promote understanding of conventional strategy application
3. Conduct near-term studies to better understand conventional strategy potential for addressing nitrogen

Compost

1. Develop a new APCD VOC emissions factor specific to dairy manure compost that reflects the most up-to-date research.
2. Develop dairy manure composting scenarios using San Joaquin Valley APCD calculator
3. Conduct an economic and supply/demand analysis of dairy manure compost
4. Develop a tool/flowchart to educate dairy producers on the permitting requirements and control technologies needed to increase dairy manure compost production
5. Conduct a study/literature review to evaluate existing information and research gaps on environmental, transportation, and food safety impacts

Denitrification

1. Conduct economic and environmental outcomes studies on existing vermifiltration pilot facilities
2. Construct two vermifiltration pilot projects in California: one with and one without a digester
3. Conduct a communications campaign on the availability of Alternative Manure Management Program (AMMP) funding for vermifiltration systems
4. Construct a full-scale algae raceway on an existing California dairy *with* a digester.

Nitrogen Capture and Treatment

- Recap of Recommendations:
 1. Fund construction of an evaporative liquid waste processing project in California based on specific criteria
 2. Conduct crop trials using processed manure / ammoniated liquid extract from an existing evaporative liquid waste processing facility
 3. Conduct environmental and economic studies of an evaporative liquid waste processing system to ensure its viability in California
 4. Conduct environmental and economic studies of existing polymer separation/flocculant-based systems
 5. Work with developers to develop a concept and budget to construct a full-scale polymer separation/flocculant-based California pilot facility

Updates on Dairy Plus Program



Dairy Plus Program in Numbers

37

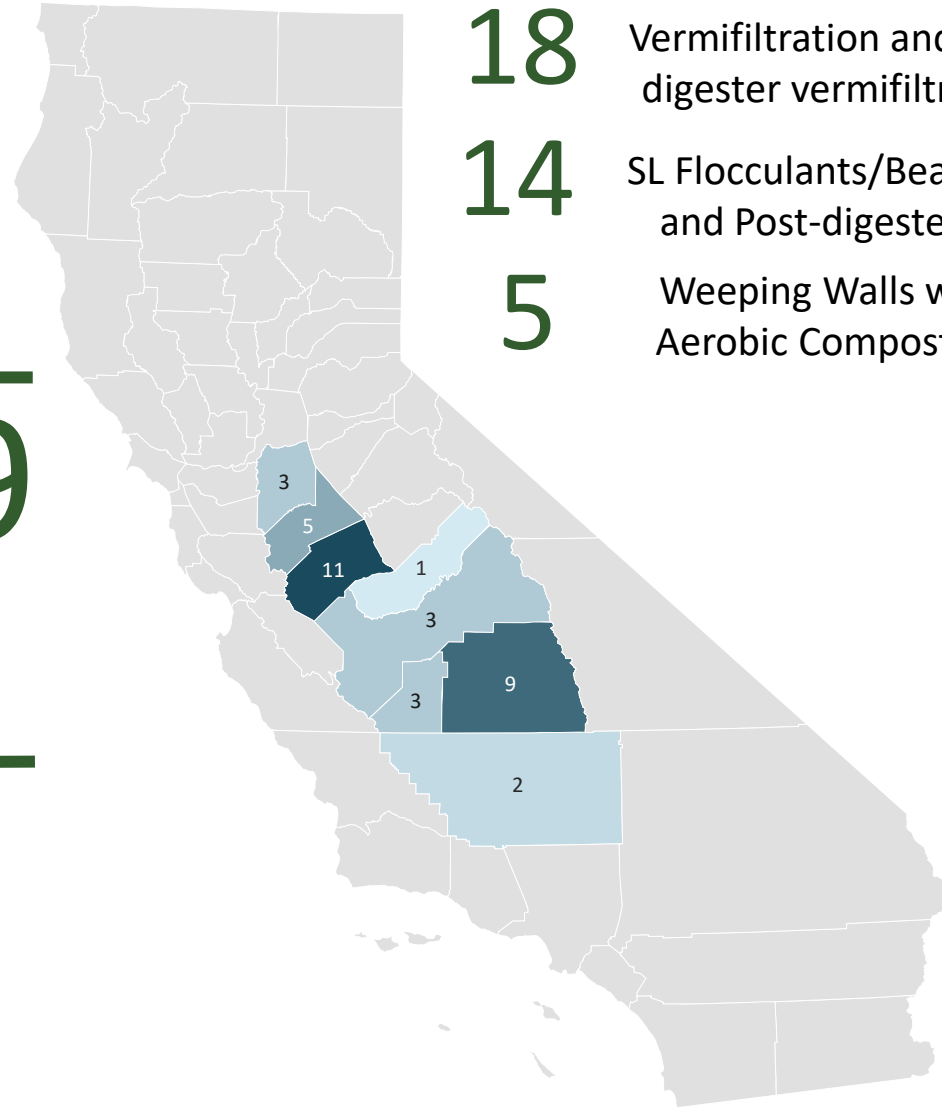
Dairy Plus Projects on CA Dairy Operations

232,509

Metric Tons of CO₂e reduced/year **together with AMMP and DDRDP**

\$43.6 M

Awarded from 2023-25



18

Vermifiltration and Post-digester vermifiltration

14

SL Flocculants/Beads (SLFB) and Post-digester SLSFB

5

Weeping Walls with Aerobic Composting

8

Counties

\$57.8 M

Matching Funds from private and State sources (estimated)

2026 Solicitation

- Approximately **\$32M available** for award, or 25 extra projects.
- Planning for a solicitation in June 2026, with an estimated 60-day application period window.
- Projects that have not received AMMP or DDRDP will be eligible for award in this round of solicitation.
- More details will come soon!



COMING SOON

Additional Progress

- As of March 2025 – largely driven by anaerobic digester projects, dairies had installed (or were in the process of installing) Tier 1 liners (double-lined with leachate collection) on 168 manure retention ponds – reducing losses of nitrate to groundwater
- With funding from the USDA Natural Resources Conservation Service, CDFA's SWEEP program and other sources, 38 dairies have installed 43 manure subsurface drip fertigation systems on a total of 5,581 acres of dairy forage – reducing greenhouse gas emissions and losses of nitrate to groundwater while producing more 'crop per drop' of irrigation water

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BIOFILTRO™
WORM-POWERED SOLUTIONS

MRIP Task Force Meeting

2 March 2026



THREE PILLARS: THE BIOFILTRATION DIFFERENCE



INTRODUCING

Our Three Pillars

WATER

AIR+CLIMATE

SOIL

1

Water

- 🌀 Organic Waste Remediation
- 🌀 Fugitive Pollution Control of Phosphorus and Nitrogen
- 🌀 Improving Wastewater Quality
- 🌀 Reduce Need for Fresh Water as Dilution Source
- 🌀 Regulatory Compliance

INTRODUCING

Our Three Pillars

WATER

AIR+CLIMATE

SOIL

2

Air & Climate

- 🌱 Climate Change Opportunity
- 🌱 Methane Avoidance System
- 🌱 N₂O Reduction
- 🌱 Ammonia Conversion
- 🌱 Energy Efficiency

INTRODUCING

Our Three Pillars

WATER

AIR+CLIMATE

SOIL

3

Soil

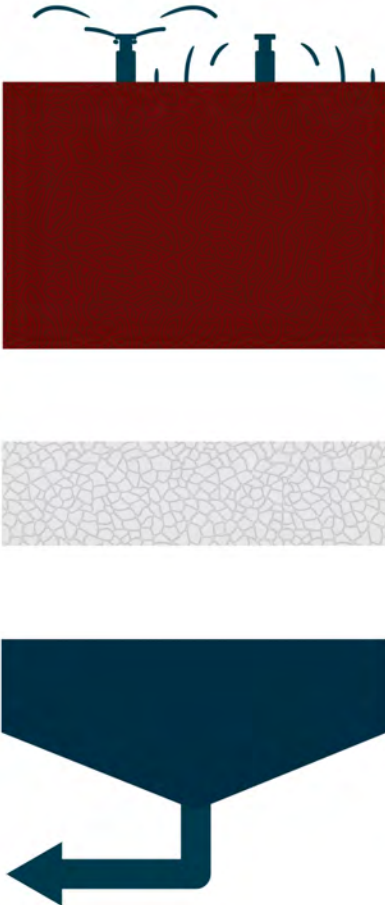
- Valuable Vermiproduct (VPR)
- Long-term Soil Health
- Soil Carbon Sequestration
- Chemical Input Reduction

OUR SOLUTION



THE SOLUTION

BioFiltro Patented BIDA System



BioFiltro's patented **Biodynamic Aerobic BIDA[®] Vermifiltration System** allows producers, companies, and communities to preserve their natural resources, reduce their carbon footprint, create new economic opportunities, and improve their relationship with the environment.

BioFiltro's vermifiltration system simultaneously serves as a solid-liquid separator, a treatment system for wastewater and solids, a nutrient removal and recovery technology, and a GHG emissions avoidance technology.



Status update

Goal: 1,000,000 MTCO₂/yr of Methane Avoided

How it started:

On-Farm Emissions Reduction

- Bring **innovative manure management** intervention to dairies
 - Set farmers up for **success with impending nutrient control regulations**
 - **Create flexibility** for how dairies operate

How it's going:

Operating:

- 7 (one post-digester) – 2 in W, 5 in CA

Under Construction:

- 4

Design/Permitting:

- 5

In the pipeline:

- 25

Status update

BioFiltro Delivers



Why does a farm choose vermifiltration?

“Here in California, anaerobic digesters have always been the hot topic,” Agueda says. “A lot of people around us were doing that, but we’re very far away from any of those major pipelines. It just didn’t make economic sense to tap into a pipeline. Plus, we were looking for a solution that would also address nitrogen management.”

*- Anthony Agueda, Alberto Dairy
Progressive Dairy Article February 7, 2026*

A stylized sun icon with a dark teal center and several radiating lines, set against a lighter teal circular background. The sun is positioned on the left side of the slide.

Benefits Beyond Carbon: Water and Soil

Vermicompost Products



Vermicompost

A refined blend of worm-processed organic matter and aged woodchips, developed to support soil vitality and long-term productivity.



Vermi Mulch™

Wood chips naturally aged through a two-year vermifiltration process—excellent for mulching and water conservation.



Worm Castings

Organic matter refined by earthworms. Add Worm Castings to build healthier and thriving soil.

Their value to the soil

BioFiltro's Vermicompost, VermiMulch and Worm Castings are natural byproducts of earthworms, created as they digest organic matter and transform it into materials that enhance soil health.

- *Sequester carbon by increasing organic matter over long term*
- *Contribute to long-term soil performance by integrating highly processed organic material*
- *Enhance physical properties of soil, supporting improving moisture management*
- *Encourage natural processes that sustain soil productivity and crop quality.*



Longevity

BioFiltro's benefits to the farm

- Treated water from a BIDA system offers **long-term flexibility and opportunity:**
 - Enables adoption of center pivot or drip irrigation instead of flood irrigation vastly improving water use efficiency
 - In water impacted regions (western US), enhanced water use efficiency is central to cropping and the avoidance of fallowing land
 - **Increased cow comfort;** utilize treated water as part of flush cycle
 - Prepared for **impending nutrient regulations**

**Thank you for your support to date
and going forward**





BIOFILTRO™
WORM-POWERED SOLUTIONS

Steve Rowe
Chairman



srowe@biofiltro.com



Manure Recycling and Innovative Products Task Force

Transforming Manure from a Liability to An Asset

March 2, 2026

FIGURE



ENVIRONMENTAL

Who We Are

- We develop and deploy advanced asset recovery systems on California dairies. **It not waste when it is upcycled.**
- We focus on practical implementation within existing dairy infrastructure.
- We convert manure streams into marketable products while improving profits, herd health, water quality and environmental outcomes on the dairy itself.





California Roll Out and Acceptance

2018 – 2019



Pilot Trailer Demo Unit

2020-2021



AMMP Grants through CDFA

2023 - 2025



Dairy Plus Grants CDRF/USDA/CDFA

2026 & beyond



Dairy Plus and Expansion through Private Investments

First USA installation 2012...First CA installation 2021

******2025 First verified methane avoidance carbon credit project in California using flocculant-assisted manure separation******

Scaling in California



Scaling in California



Deployment Pipeline

Building momentum toward broader statewide adoption.

5

**Additional
California sites
scheduled for
installation in 2026**

6

**Additional
California sites
scheduled for
installation in 2027**

1

**Projects awarded
under Dairy Plus
funding**

Barriers observed in **California** deployment

- Inertia...”show me one in CA” consultants, academics, and regulators
- Regulatory Carbon Market only allowed Digester projects not “methane avoidance”
- Alignment between funding cycles and CA approved practice for Grants
- Concern about operational expense
- Solids Off-take partners for new business

On-Farm Operational Benefits and Increase Profits that pays for all OPEX



Producers report measurable operational improvements:

- Increased ability to use recycled water without overloading crops while saving on fertilizer purchases
- Reduced freshwater demand
- Improved nutrient management flexibility not just manage lagoon storage
- Improved crop productivity and soil health
- Increase herd health, reduced somatic cell counts, barn gases, odor, and slipping
- Increase milk production and pregnancy rates with lower stress on the cows



Measured Outcomes



- Up to 99% reduction in total suspended solids
- 35%–60% reduction in total nitrogen
- 70%–85% reduction in phosphorus
- 10%–15% reduction in potassium and salts
- Up to 90% reduction in volatile solids
- Supports nutrient management compliance, sustainable groundwater use, and improved CI scoring through methane avoidance and volatile solids reduction.



Solids Value and Use

Unlock additional value pathways.

- Typical nutrient content by weight Raw Manure:
 - ~4% N ~1.5% P ~0.5% K
- Typical nutrient content by weight Digestate Manure:
 - ~6% N ~3% P ~0.75% K
- High organic matter content
- **High BTU Solids** can serve as feedstock for:
 - Anaerobic digesters to increase profits & biogas production
 - Gasification and biochar production
- Soil Amendments for topsoil replacement projects, green houses, home and garden opportunities



Profitability for both Dairies & Technology Partners

Revenue pathways include:

- Sale of recovered liquid and solid nitrogen fertilizer
- Carbon credit monetization
- Manure leasing or Supply agreements
- Subscription-based manure management models
- Average cost benefit analysis of \$150 - \$200 per cow to producer

Supporting Continued Deployment

- Getting all Methane Avoidance Projects approved to be able to participate in the Regulatory Carbon Credit Markets not just Voluntary Market.
- Support and coordination for the bio-based or organic fertilizers. Help with potential off takers. Healthy Soils Program or others. Collaborate with other agencies like Caltrans for use on their construction and hydroseeding projects.
- Support for pilot projects to begin the “Innovative Products” upcycling.

We're committed to **practical deployment, measurable results,**
and **long-term collaboration** in California.

We appreciate the opportunity to participate
and welcome continued dialogue.



Learn more at

www.fig8env.com

Meeting Agenda

Recap of MRIP and Vision Moving Forward

Progress on MRIP Goals

Spotlight: Pilot Projects

MRIP-Relevant Regulatory Developments

MRIP-Relevant Research

Discussion: What Else is Needed to Identify and Scale Solutions for Surplus Manure?

Closing Remarks

State Water Resources Control Board 2024 Draft Dairy Order

Manure Recycling and Innovative Products Task Force

Annalisa Kihara, Assistant Deputy Director
Division of Water Quality

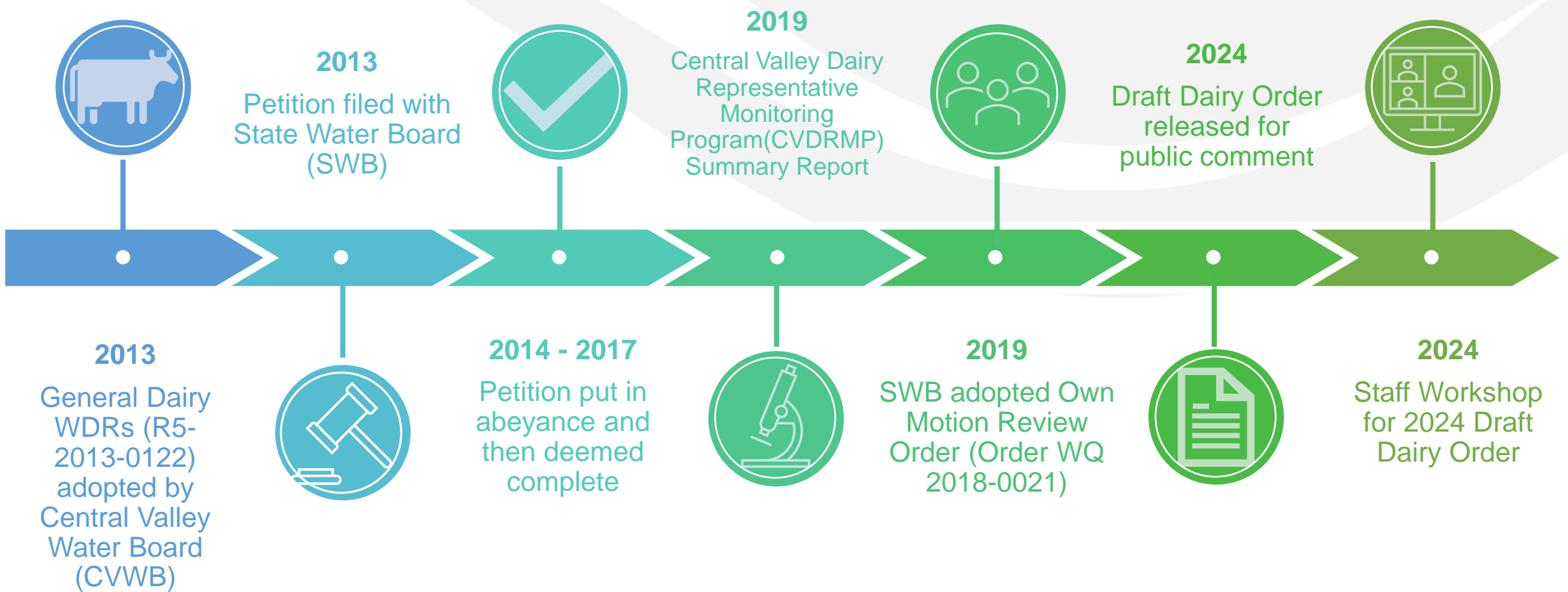


March 2, 2026

Presentation Outline

1. Background
2. Petition (2013)
3. Draft Dairy Order (2024)
4. Upcoming Adoption Process

Dairy Order Timeline



Petition (2013)

- Water Code § 13320 allows anyone to challenge a Regional Water Quality Control Board (Regional Water Board) decision by petitioning the State Water Resources Control Board (State Water Board)
- Rules:
 - State Water Board acts in a “judicial function”
 - State Water Board may review Regional Water Board action on its own, with no deadline to make a decision
 - State Water Board has discretion as to which issues it will address

Petition (2013)

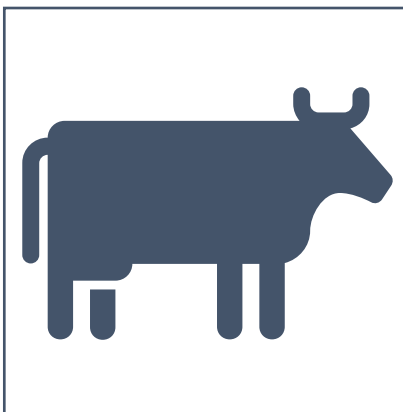
Petitioners:

Asociación de Gente Unida por el Agua (AGUA) and Environmental Law Foundation (ELF)

Issues Raised in the Petition:

The State Water Board's Antidegradation Policy, Porter-Cologne Water Quality Control Act, and the state's human right to water and antidiscrimination laws.

Draft Dairy Order (2024)



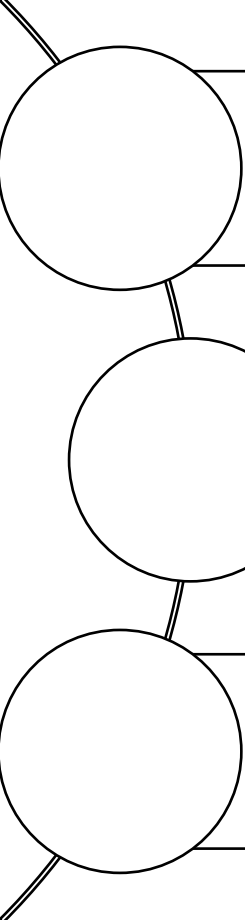
Establishes new framework to regulate dairy discharges

- New requirements: (a) land application, (b) waste retention ponds, and (c) providing alternative drinking water for affected residents
- Objective is to achieve a performance standard that ceases to cause or contribute to concentrations of nitrate in groundwater that exceed water quality objectives

Remands the Dairy General Waste Discharge Requirements (WDRs) to the Central Valley Regional Water Board with direction to develop revised General WDRs for dairies consistent with the Draft Dairy Order



Draft Dairy Order (2024) acknowledges the need for:

- 
- Investments in dairy waste management improvements
 - A more precise understanding of the fate and transport of dairy waste discharges to groundwater
 - Continued development of technological and market improvements to facilitate the distribution and use of dairy waste for off-site use



Manure is a
renewable
resource!

Upcoming Adoption Process

- Staff reviewed public comments submitted for the 2024 Draft Dairy Order
- Updated Draft Dairy Order expected to be released in the first half of 2026 for public comment and a Board workshop
- Updated Draft Dairy Order expected to be brought before the Board for adoption in 2026

OWN MOTION REVIEW OF WDRS GENERAL ORDER NO. R5-2013-0122 FOR EXISTING MILK COW DAIRIES SWRCB/OCC FILE A-2283(b)

Public Comment Letters on October 1, 2024 Draft Dairy Order

Available at <https://ftp.waterboards.ca.gov>
username: OCC-CommentLetters-FTP
password: eiwo1xqw1Q1uZKaM

Virtual Staff Workshop, October 30th, 2024

The staff workshop will be conducted via Zoom in English and Spanish at **9:00 a.m.** on October 30, 2024. Staff will provide an overview of the draft Dairy Order and answer questions. Registration is not required. The workshop will be recorded, and a copy of the recording will be posted on this website by November 4th.

- Virtual Staff Workshop, October 30, 2024
 - Presentation in English
- Taller virtual para el personal, 30 de octubre de 2024
 - Presentación En Español

Stay Informed

[Subscribe to future emails from the State Water Board regarding this proceeding.](#)

https://waterboards.ca.gov/public_notices/petitions/water_quality/r5-2013-0122.html

Thank you!



Annalisa Kihara, P.E.
Assistant Deputy Director
Division of Water Quality
State Water Resources Control Board

Questions/ Comments?



Nitrate Control Program Update

Bob Ditto

Central Valley Water Board

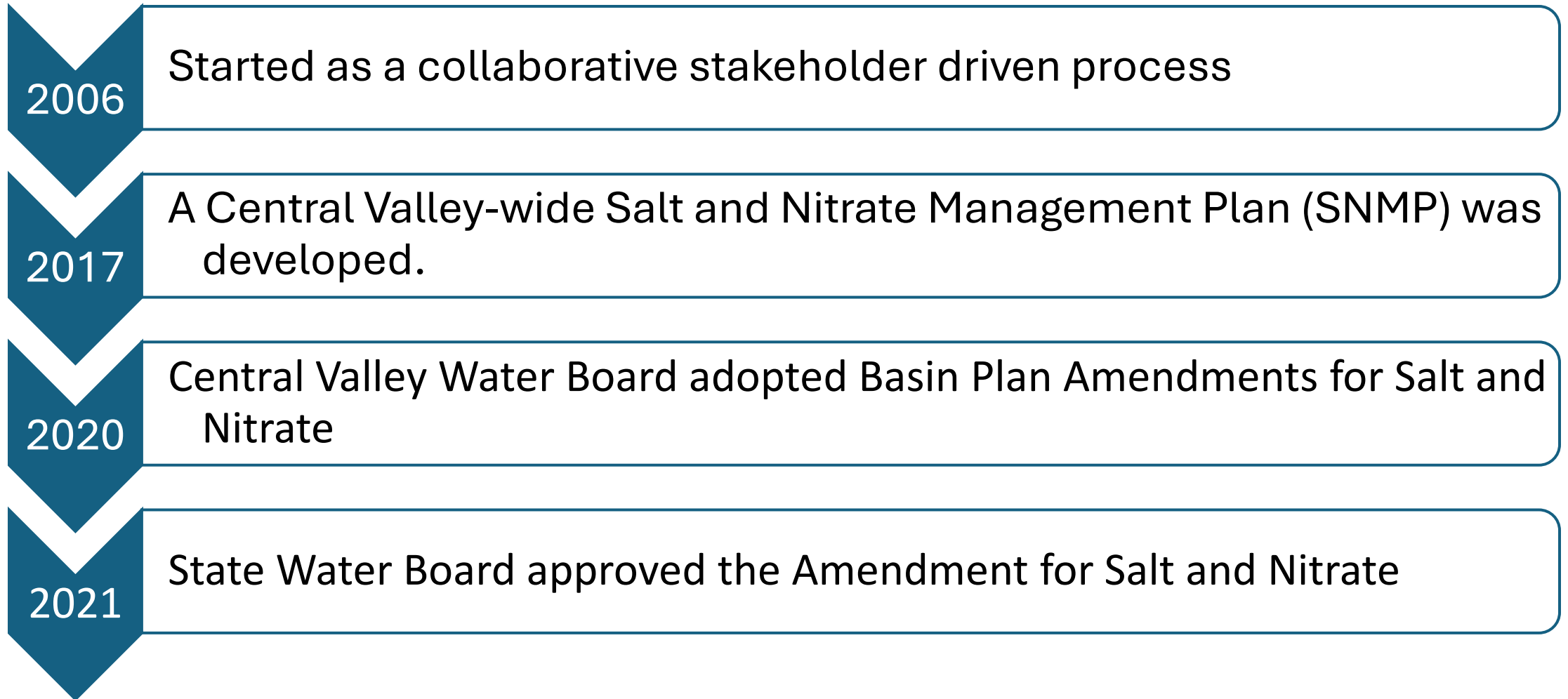
Nitrate Control Program Manager

Robert.ditto@waterboards.ca.gov

916-464-4642

Central Valley Salinity Alternatives for Long-Term Sustainability

CV-SALTS History (est. 2006)



**CV-SALTS
Basin Plan Amendments**

Nitrate Control Program

a prioritized program for groundwater

**Individual Permitting
Approach (Path A)**

**Management Zone
Permitting Approach
(Path B)**

Salt Control Program

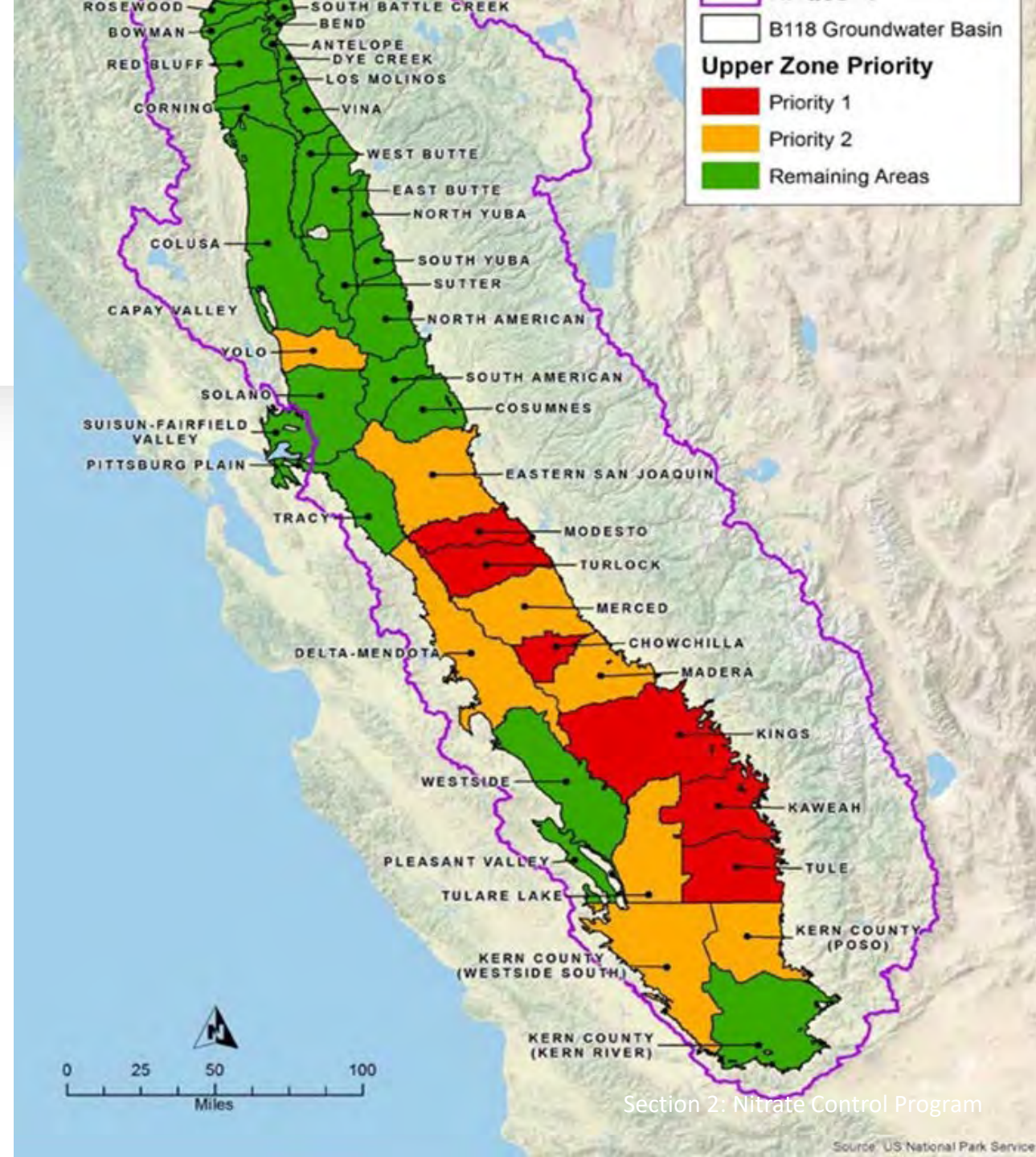
a phased program for both surface and groundwater

**Conservative
Permitting Approach**

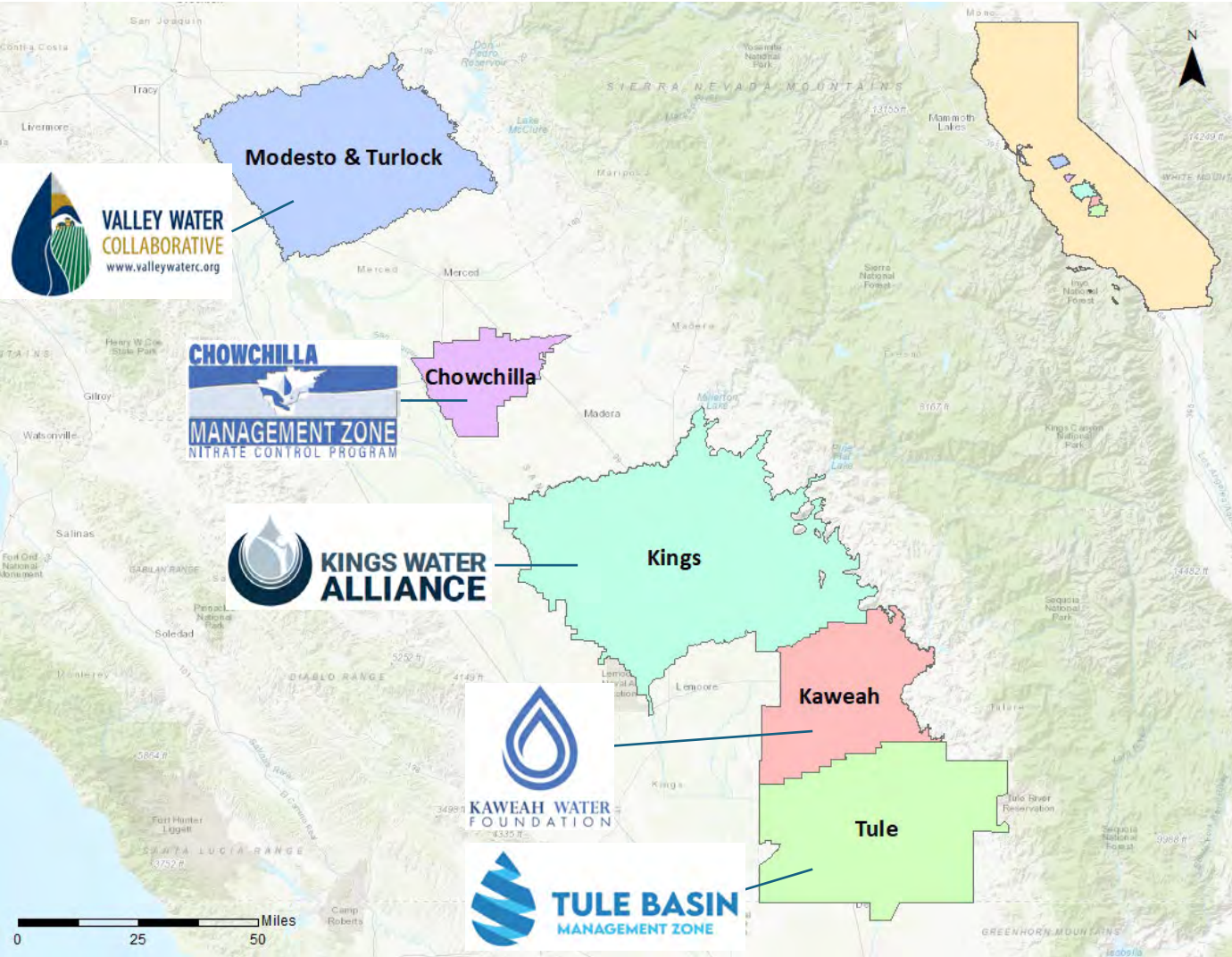
**Alternative Permitting
Approach**

Nitrate Control Program Prioritization

- Priority 1 Area (Red)
- Priority 2 Area (Orange)
- Remaining Areas (Green)



Priority 1 Management Zones (MZs)



- ▶ Valley Water Collaborative
- ▶ Chowchilla Management Zone
- ▶ Kings Water Alliance
- ▶ Kaweah Water Foundation
- ▶ Tule Basin Management Zone

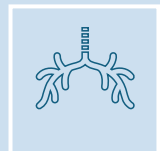
Nitrate Program Goals



Provide safe drinking water supply



Reduce nitrate loading to protect groundwater resources



Implement long-term, managed restoration to aquifer

Management Zone Approach (Path B)

- Shared responsibility for Implementation
- Must provide safe drinking water to affected communities/residents
- Granted exception from nitrate standard for Dischargers
- Enforced through discharge permit provisions



Management Zone Implementation Plan (MZIP)

Drinking Water Solutions

- Emergency & Interim Drinking Water Program
- Long-term Drinking Water Solutions

Nitrate Reduction Program

- Sector-based Plan to reduce loading and no longer cause or contribute

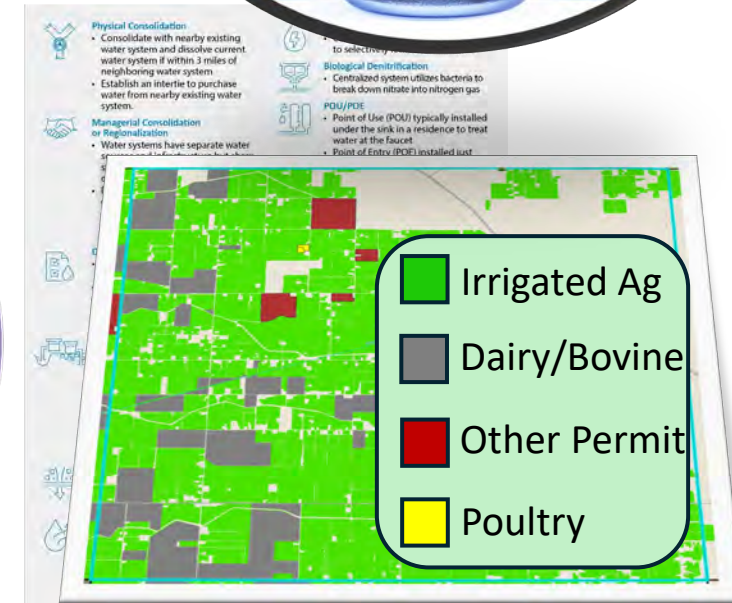
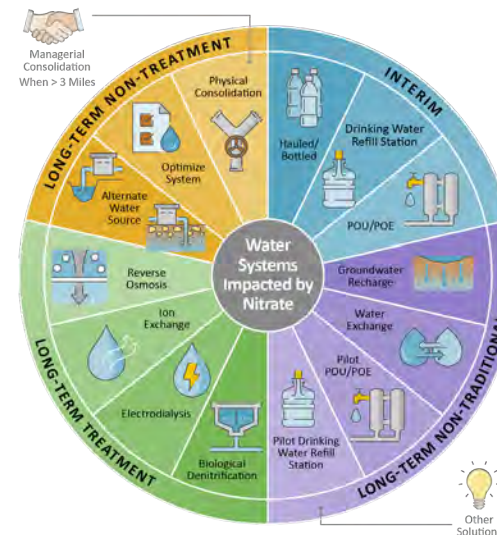
Other Key Components

- Managed Aquifer Restoration
- Surveillance & Monitoring
- Ongoing Outreach, Compliance Assessments & Reporting

...and more



Drinking Water Solutions
Public and State Water Systems



NITRATE REDUCTION PROGRAM

Nitrate Reduction Program Goal: Reduce nitrate loading so that ongoing discharges do not cause or contribute to exceedances of water quality objectives

Exceptions Policy allows up to 35 years to comply, but subject to periodic review

Sector-based Programs

- Irrigated agriculture Coalitions
- Dairy Facilities
- Bovine Facilities
- Poultry Facilities
- “Non-Chapter 15 Program” individual dischargers (e.g., wastewater facilities, food processors, biosolids facilities)

Process to Develop Sector-based NRPs

Step 1 – Prepare or update estimate of nitrogen loading by sector or discharger based on existing data (pounds/acre/year)

Step 2 – Establish sector-based nitrogen reduction milestones (goals)

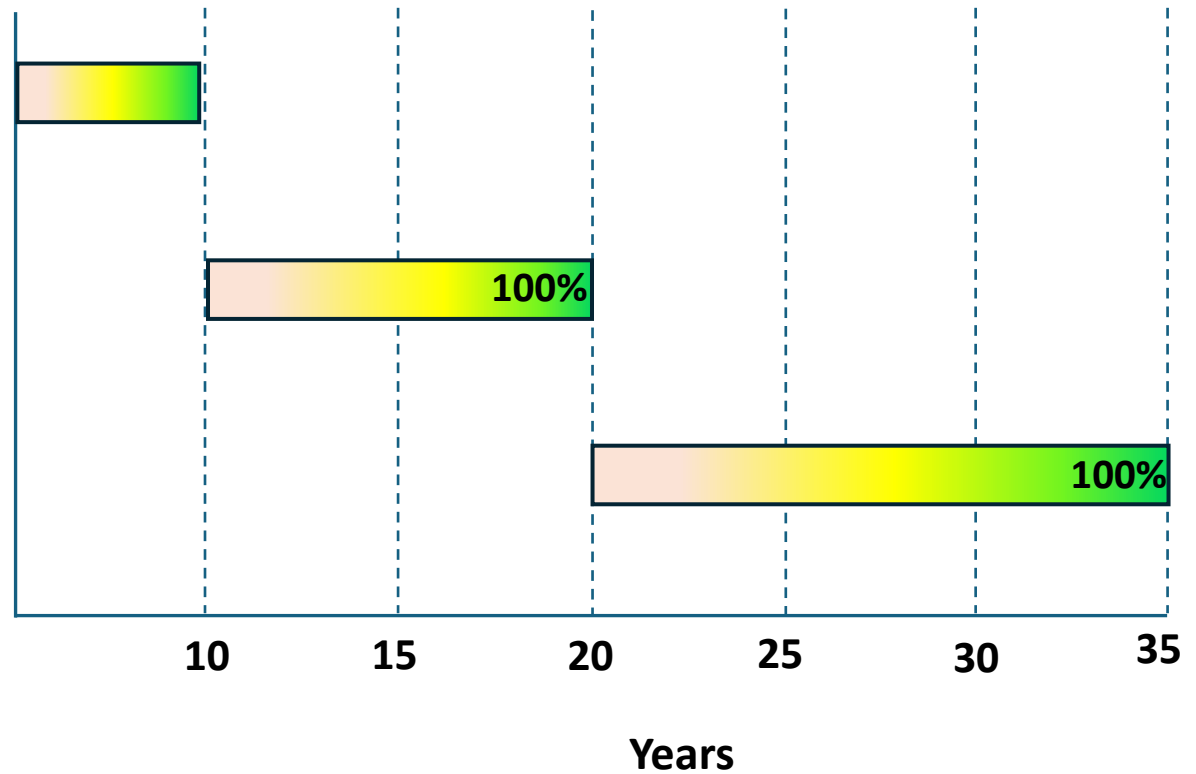
Step 3 – Develop schedule of implementation activities (interim milestones) for each sector to meet goals

DAIRIES – Nitrate Reduction MILESTONES

100% of dairies achieve zero whole farm manure-N balance

Completion of 20-year milestone(s) - to be identified in updated Dairy Nitrate Reduction Plan to be prepared by Year 10

100% of dairies meet Nitrate Control Program final goal





Whole Farm Nitrogen Balance for Dairies

- Accounting of all nitrogen inputs and outputs on a dairy facility
- Achieve a zero surplus of manure nitrogen—meaning that the amount of nitrogen brought onto the farm (primarily in fertilizer) is balanced by the amount of nitrogen removed from the farm (in milk, meat, exported manure, and harvested crops)
- Amount of nitrogen applied to cropland does not exceed what is removed by crops.
- The ultimate objective is to prevent excess nitrogen from leaching into groundwater as nitrate

Manure Recycling and Innovative Products Task Force



IMPORTANT PART OF
EQUATION



DEVELOP NEW
TECHNOLOGIES TO
REDUCE LOADING



NEW PRODUCTS TO PUSH
INNOVATION



HELP ACHIEVE WHOLE
FARM NITROGEN BALANCE

Central Valley Water Board Modesto Management Zone Order

- Approves MZIP with additional Monitoring and Reporting Requirements
- Incorporates applicable NRP objectives as enforceable milestones
- The Management Zone will implement a Nitrate Reduction Compliance Assessment Program, through which it will identify and implement nitrate load reduction targets on a township basis for all participating dischargers. These targets will be used by the Management Zone to progressively reduce nitrate loading across the Management Zone area and identify areas or sectors where additional efforts are needed.

Adoption Schedule for Modesto Management Zone Order

NOTICE OF PUBLIC HEARING &
OPPORTUNITY TO COMMENT

March 2026

3 June 2026

HEARING TO ADOPT THE MODESTO
MANAGEMENT ZONE IMPLEMENTATION
PLAN (MZIP) & AMENDING WASTE
DISCHARGE REQUIREMENTS TO
INCORPORATE THE NITRATE CONTROL
PROGRAM

Nitrate Control Program Contact

Bob Ditto

Central Valley Water Board

Nitrate Control Program Manager

Robert.ditto@waterboards.ca.gov

916-464-4642

Meeting Agenda

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MRIP-Relevant Regulatory Developments

MRIP-Relevant Research

Discussion: What Else is Needed to Identify and Scale Solutions for Surplus Manure?

Closing Remarks

A background image showing a group of cows in a barn, with a green and blue gradient overlay.

MANURE RECYCLING AND INNOVATIVE PRODUCTS TASK FORCE

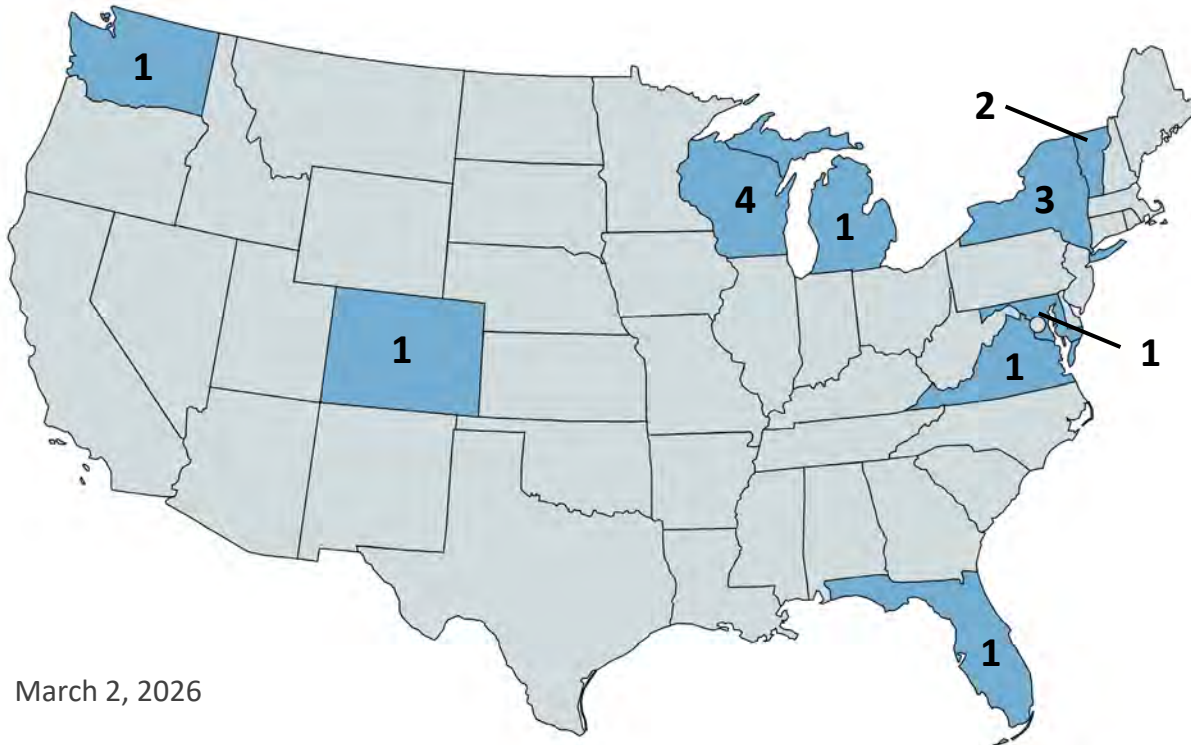


2020 CONSERVATION INNOVATION GRANT

Evaluating Environmental/Economic Benefits of Dairy Manure Technologies for Improving Water Quality

\$1.0M PROJECT: NRCS reimbursed \$0.5M; Newtrient invested \$0.4M; additional \$0.1M partner contributions

15 TECHNOLOGIES EVALUATED



51 OUTREACH DELIVERABLES

13

Vendor
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Comprehensive
Reports

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Webinars

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Informative
Videos

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Conference
Presentations

Visit Newtrient.com for all resources

STATUS	TECHNOLOGY
<i>Complete</i>	<ul style="list-style-type: none"> • Solid Liquid Separation – Literature review of available data sets • ACT – Virginia Tech, VA • Biomass Controls – Spruce Haven Farm, Union Springs, NY • 360YieldCenter (360Rain) – Double S Dairy, Markesan, WI • McLanahan Mechanical Sand Separator – Robinway Dairy, Kiel, WI • Livestock Water Recycling (LWR) with Reverse Osmosis – Robinway Dairy, Kiel, WI • N2 Applied – CoBar Dairy, Mount Upton, NY • Aqua Innovations – Northern Biogas, Middleton, WI • Biofiltro Vermifiltration – Royal Dairy, Royal, WA • Centrisys Centrifuge System – Deer Valley Dairy, Fort Morgan, CO • FAN Bedding Recovery Unit (BRU) “Drum Composting” – Fessenden Dairy, King Ferry, NY • Nitrate Mitigation System – Alliance Branford Dairy, Trenton, FL • PondLift Active Aeration System – Hood Dairy, Paw Paw, MI • SWECO Vibratory Separator – Kilby Dairy, Rising Sun, MD • Windrow vs Agrilab Compost Aeration & Heat Recovery – VT Natural Ag Products, Middlebury, VT

NEWTRIENT SNAPSHOT

Soil and Water Engineering Technology, Inc.
Nitrogen Interception Technology

BUSINESS OVERVIEW

Soil and Water Engineering Technology, Inc. (SWET) is an engineering consulting firm based in the state of Florida, a region rich in precious hydrological systems. Comprised of a team of experts in water conservation and protection, SWET serves both public and private clients across the southeast. Their expertise includes consulting services in water resource modeling, pollution abatement strategies, implementation of agricultural best management practices, and design solutions for animal waste management.

PROJECT TECHNOLOGY OVERVIEW

Manure applied to crop and pastureland has the potential to leach nitrates into groundwater. To preserve water quality, SWET's subsurface nitrogen interception technology aims to minimize the nitrogen load from liquid manure in groundwater. This is achieved by installing a series of intercept wells beneath irrigation pivots to capture water with high nitrogen levels before it reaches the surface of the underlying aquifer. Once intercepted, this water is collected and recycled to the surface for plant uptake, lowering nitrogen concentrations. Use of a denitrification bioreactor can further reduce nitrate levels.

PROJECT SIZE

The nitrogen interception technology is designed so that total pumped volumes match the annual leaching volume from rainfall in a given region. In a Florida-based study, wells were installed at a depth of 50-60 feet below the surface, approximately 10 feet below the seasonal low groundwater table. Water from one well flowed freely continuously at an estimated rate of 50 gallons per minute into a 12,000-cubic foot woodchip denitrification bioreactor.

REQUIREMENTS

Before implementing nitrogen interception technology, manure and soil should be tested to optimize nutrient management. Intercept wells should be placed equidistantly beneath the irrigated area. Placement and pump rates are strategically designed to create localized hydrological depressions, enabling efficient interception and redirection of leachate. Flow meters from the wells to both the bioreactor and irrigation system should be monitored weekly. Regulatory compliance, comprehensive training, and routine maintenance with accurate record-keeping ensures optimal system performance.

KEY CALL-OUTS

- Reduced Groundwater Nitrogen Levels:** Intercept wells capture nitrogen-rich water that seeps below the vadose zone.
- Enhanced Water Quality:** Reduced nitrogen loads to surface and groundwater minimize risks to environmental and human health.
- Improved Nutrient Management:** Reuse of nutrients creates an efficient, closed-loop system.
- Cost Savings:** Improved nitrogen use efficiency decreases reliance on commercial fertilizers to offset nutrient losses.

Findings are based on an evaluation conducted under a Conservation Innovation Grant awarded to Newtrient. To view a more detailed description of these results, visit the SWET Nitrogen Interception Technology Evaluation Summary on the Newtrient website.

Newtrient, LLC | www.newtrient.com | February 2025

Vendor Snapshots

NEWTRIENT EVALUATION SUMMARY

CONSERVATION INNOVATION: SMART SOIL
Nitrogen Interception Technology
Dairy Manure Treatment Innovations - Enhancing Water Quality and Sustainability

University Partner
Dr. Mark Clark
University of Florida
Institute of Food and Agricultural Sciences
P.O. Box 110180
Gainesville, FL 32611-0180

FEBRUARY 2025

INSIDE

- Background 1
- Introduction 1
- The Process 2
- Methodology 4
- Sample Collection 4
- Woodchip Denitrification 4
- Load, Intercept, and Treatment 4
- Discussion of Results 4
- Key Benefits 4
- Key Challenges and Issues 6
- Implications 7
- References 7

BACKGROUND

Dairy farming plays a vital role in agriculture, providing essential products while supporting local economies and communities. The industry is committed to sustainable practices, recognizing the need to balance food production with environmental stewardship, economic viability, and social responsibility. Like all agricultural operations, dairy farms must carefully manage nutrients to protect precious natural resources. One area of ongoing focus in nutrient management is the nitrogen cycle, as nitrogen compounds from manure applications can leach into groundwater and surface water, potentially affecting water quality.

While traditional nutrient management strategies, such as optimizing irrigation and fertilizer application rates, have been effective in reducing nitrogen losses in many cases, knowledge gaps remain—particularly regarding nitrogen interception once it moves below the vadose zone. Addressing these gaps is crucial, especially in regions where local geology presents unique challenges. For example, in Branford, Florida, the absence of clay confining layers between the surface and the Floridan Aquifer increases groundwater vulnerability. This geology allows nitrogen-rich leachate to move more rapidly into the aquifer, while the area's karst features, including springs, create additional pathways for nitrogen transport to connected water bodies.

INTRODUCTION

This study specifically aimed to address nitrogen leaching into groundwater, specifically in the form of nitrates, a critical environmental challenge for the dairy industry. In regions like Branford, Florida, where the lack of clay confining layers and the presence of karst features heighten groundwater vulnerability, nitrogen from manure applications can readily move into the aquifer and connected water bodies. Traditional best management practices have successfully reduced surface nitrogen loads; however, they offer limited solutions for intercepting nitrogen after it leaches below the vadose zone.

Newtrient, LLC | www.newtrient.com | February 2025

Evaluation Summaries

NEWTRIENT

APPLICATION FOR COMPONENT ADDITION TO NRCS

NRCS Practice Standard 629

For Acceptance of Nitrogen Interception Technology

STUDY PREPARED BY:
Mark Stoermann
Newtrient Technology Advancement Team

February 2025

Comprehensive Reports

www.newtrient.com



NEWTRIENT RESOURCES

SOLUTIONS CATALOG

RESOURCE LIBRARY

BLOG

Sector

- Additives
- Practices
- Services
- Technology

Link: Canadian Digestate Management Guide

Published by the Canadian Biogas Association, the Canadian Digestate Management Guide provides practical and useful information for maximizing the benefits of the safe use of digestate products.

Webinar: WA Sustainability Webinar Series: Solutions for Environmental and Economic Sustainability

Chris Kopman provides an overview of Newtrient's mission, services, and resources for finding solutions addressing the environment and economic challenges faced by dairy producers during a recent sustainability webinar held by Washington Dairy.

White Paper: State of the Science Summit - Feed Strategies to Reduce Enteric Emissions

On May second and third, 2023, the CFDA; UC Davis College of Agricultural and Environmental Sciences; and UC Davis CLEAR Center hosted the State of the Science Summit: Feed Strategies to Reduce Enteric Emissions. Since then they have issued this written report to capsule some of the information shared.



Dairy Soil & Water Regeneration

- \$23+ million in funding | Started in 2021 | Spans 8 years
- Initiated by Dairy Management Inc. and Soil Health Institute in collaboration with eight research institutions, consultants and farmers
- Funders: Foundation for Food & Agriculture Research, Newtrient, Nestlé, Starbucks and Emmi Roth in Wisconsin

Goal: Building soil health to reduce greenhouse gases, improve water quality and enable new economic benefits



Soil carbon sequestration
for regional dairy feed
rotations



Environmental, agronomic
and delivery outcomes
of new manure-based
fertilizer products



Soil health
and water benefits



100 farms engaged ■ 17 research trials ■ 13 research sites

Visit dairysoilwater.org to learn more

Dairy Soil & Water Regeneration

Research Teams News

Measuring Greenhouse Gases from the Field in Idaho

Read more

As most dairy farmers today consider climate solutions, they have limited research to draw from on the impact of soil health management systems on greenhouse gas emissions and water quality in dairy systems. "Dairy Soil & Water Regeneration: building soil health to reduce greenhouse gases, improve water quality and enable new economic benefits" (DSWR) is an eight-year project conducted across the U.S. that aims to close research gaps, empower farmers in their decision-making and set the stage for new market opportunities, incentives and investments in dairy sustainability.

Research Teams

Conceptual Models

U.S. Dairy NZI

Background

DSWR is a key undertaking within the [U.S. Dairy Next Step Initiative](#), an essential first phase in a collective effort to achieve the industry's 2050 environmental stewardship goals, which were developed through the Innovation Center for U.S. Dairy. DSWR is studying soil health and manure management and their effects on greenhouse gas reduction, water quality improvement and agronomic factors such as yield and forage quality on working dairies and research farms in major dairy regions. The project, which began in 2021, includes a baseline of soil health and carbon storage as well as extensive field trials involving differing management practices and manure technologies and products.

Dairy Soil & Water Regeneration

Research Teams News

University of Wisconsin-Madison

Department of Plant and Agroecosystem Sciences
COLLEGE OF AGRICULTURAL & LIFE SCIENCES
UNIVERSITY OF WISCONSIN-MADISON

Department of Soil and Environmental Sciences
COLLEGE OF AGRICULTURAL & LIFE SCIENCES
UNIVERSITY OF WISCONSIN-MADISON

As part of the larger DSWR project, the UW-Madison team is helping to evaluate the effects of novel manure products and soil conservation practices on greenhouse gas (GHG) emissions, soil organic carbon storage and soil health parameters such as water infiltration and aggregate stability.

The UW-Madison manure product management practices are being replaced by...
The experimental design...
This work... and soil health... process...

The UW-Madison Team

Randall Jackson, Ph.D.
Professor and Project PI
Focuses on agronomy, grassland ecology, cropping systems, storage, carbon and nutrient cycling, and food security.

Matt Ruark, Ph.D.
Professor
Expertise in soil fertility and storage, nutrient management and water quality.

Gregg Sanford, Ph.D.
Assistant Professor
Expertise in cropping system ecology, soil organic carbon dynamics, soil health, crop-livestock integration and business opportunities.

Adam von Haden, Ph.D.
Scientist
Focuses on soil organic carbon dynamics, soil health indicators, plant-soil dynamics, soil management and emerging and field research opportunities.

Grace Parrott
Research Technician
Focuses on sustainable agronomic practices, with expertise in fieldwork, data collection, laboratory methods, and the analysis of soil health and water quality.

Greta Hippensteel
Research Specialist
Expertise in sustainable agronomic systems and agronomic management, agricultural field research and data collection, plant-soil interactions and research implementation and agricultural best practices.

Dairy Soil & Water Regeneration

Research Teams News

News

Updates and Events

On the Farm: Additional data proving to be valuable at Osterhoudt Farms

One way DSWR is unique is that this research is being conducted on commercial farms. One of those farms is Osterhoudt Farms in Genoa, New York, a cropping operation that offers custom services to local dairies by providing forages and utilizing dairy manure. Farm representative Andy Miller is working alongside Cornell University researchers to bring... [Read more](#)

March 12, 2025

Perspectives: DSWR will provide farmers with practical solutions

By Dr. Mara Cloutier, Soil Health Institute The Soil Health Institute (SHI) collaborated with Dairy Management Inc. on the design and development of the Dairy Soil & Water Regeneration (DSWR) project and is playing a central role in the data-driven project. Dr. Mara Cloutier of SHI shares her perspective on what sets DSWR apart from... [Read more](#)

February 14, 2025

Site Drop-in: UW-Madison's work focuses on novel manure solids

Eight research institutions across the country are participating in the Dairy Soil & Water Regeneration (DSWR) project. Adam von Haden, a scientist at the University of Wisconsin-Madison, provided an update on what's happening there. Research focus: Our work on DSWR consists of three experiments at the Arlington Agricultural Research Station in south-central Wisconsin. While the... [Read more](#)

January 25, 2025



California Dairy Research Foundation

ENVIRONMENTAL RESEARCH UPDATE



Presented To:

Manure Recycling & Innovative Products Task Force

March 2nd , 2026

Presented By

Denise Mullinax

Executive Director, California Dairy Research Foundation

Assistant Director, California Dairy Quality Assurance Program

CDRF MISSION

is to support the long-term health and sustainability of the California dairy industry through targeted research, science-based education programs, and strategic partnerships.



Scientific
Research



Education
&
Outreach



Strategic
Partnerships



Sustainability Powered by Five Focus Areas

Long-term Sustainability and Industry Resilience

Key Strategy Elements:

- ✓ Favor short-term studies with actionable results
- ✓ Select projects that encompass multiple research priorities
- ✓ Prioritize projects that address issues that are of highest concern to California
- ✓ Co-invest & collaborate whenever possible to maximize check-off dollars
- ✓ Emphasis on cost, pricing and profitability in project deliverables

Research Advisory Committees



Spring Check-ins:

- Meet with and/or Survey Each Team
- Discuss Emerging Issues and Topics
- Update and Confirm Priorities



Social
Responsibility
Advisory Team
(SRAC)


Environmental
Steering and
Advisory
Committee
(ESTAC)

Nutrition
and Health
Advisory Team
(NHAT)



Sustainability Powered by Five Focus Areas

Addresses Resources and Regulations



**Environmental
Management**

Water Quality and Quantity

Manure Management

Nutrient Management

Air Quality

Greenhouse Gas Emissions

Core Pillar of Sustainability

Targeted Research: Environmental Management

Addresses Resources and Regulations

Water Quality

Water Quantity

Nutrient Management



Air Quality

Manure Management

PM & VOC Emissions

Irrigation Management

Greenhouse Gas Emissions

Ensures and Enhances Public Trust

Past Environmental Management Projects



34

2019- 2024



Evaluation & Analysis

Food Minds: Strategic Approach to Building a Distribution and Value Chain for Dairy Cow Manure

Meyer & Sumner: An economic evaluation of strategies for methane emission reduction effectiveness and appropriateness in small and large California dairies

Clark & Meyer: Chemical and Physical Characterization of Manure

Producing Feed w/less water/Improving N Utilization - Alternate Forage Crops

Kaffka: Growing and feeding sugarbeets on dairy farms in California

Kaffka: Growing safflower for silage to enhance water and nutrient management on California Dairy Farms

Improving N export off-farm

Zhang: Production of Dairy Manure and Almond Wood Pelletized Compost for Healthy Soils

Zhang: Production of Pathogen-Free Pelletized and Granulized Products from Dairy Manure Solids

Decreasing Methane Emissions

Kebreab: Characterizing and Quantifying Grape Pomace in Reducing Enteric Methane Emissions

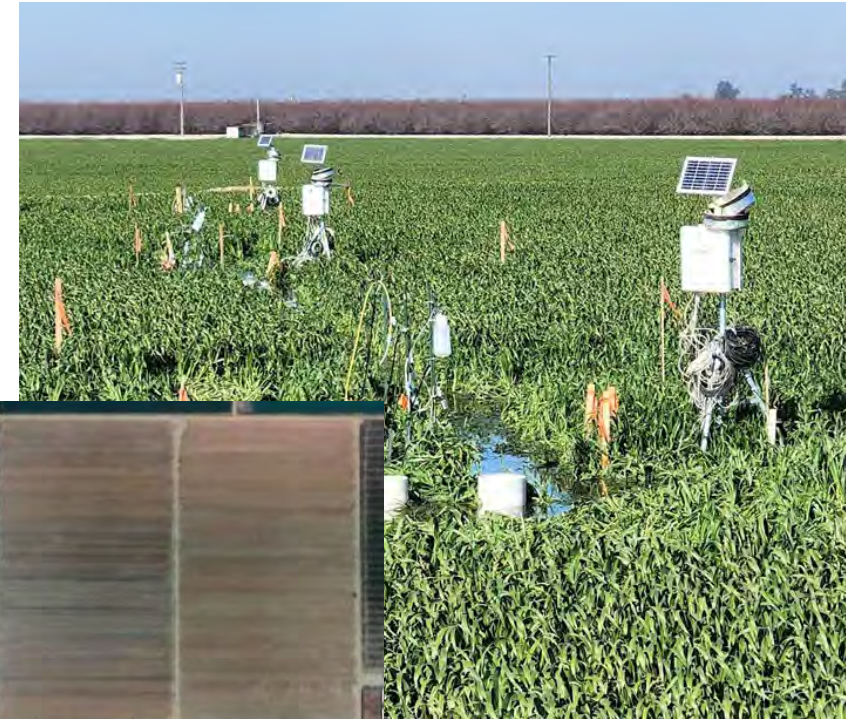
Current: Water Quantity and Quality

Dahlke: *Scoping the Environmental Feasibility of DairyMAR*

Heguy: *Benchmarking & Describing California Dairy Sustainability Metrics*

Cardoza: *Improving Water Quality by Reducing Nitrate Loss from Dairies: Demonstrating How Surplus Manure Can be Applied Safely to Almonds Using SDI*

Castle: *Enhancing Sustainability of Dairy Forage Production by Reducing Water Use & N₂O Emissions with SDI*

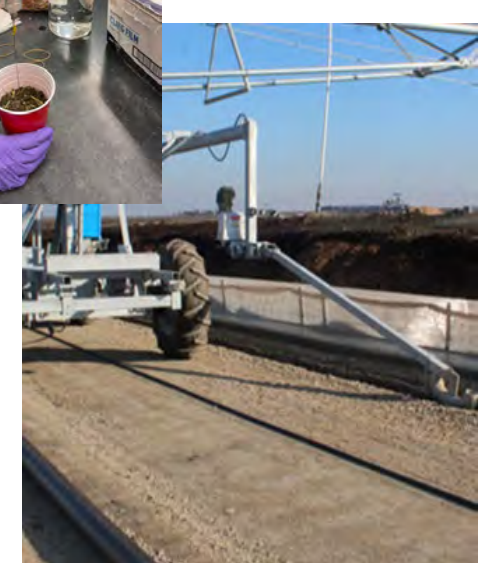
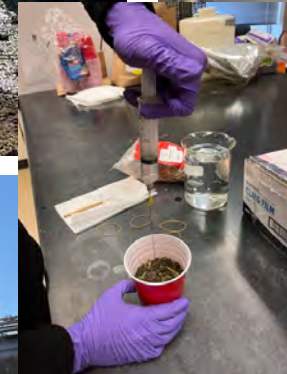
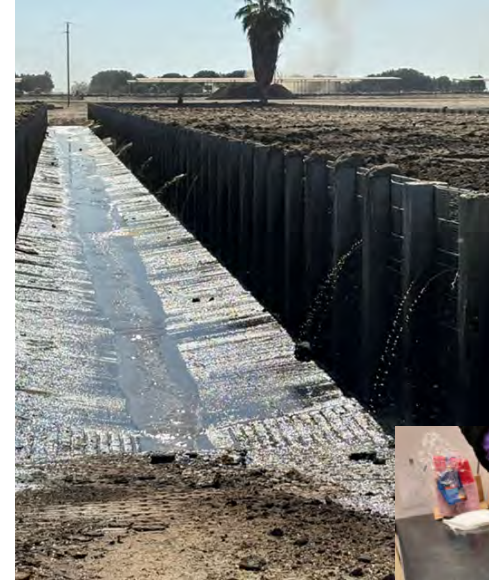


Current: Manure and Nitrogen Management

Clark: *Hand-held Meters to Measure Lagoon Water Nitrogen Content*

Meyer: *Evaluation of Manure Treatment Technologies*

Mullinax: *Advancing Markets for Producers*



Current: Air Quality and Greenhouse Gas Emissions

Payne: *Assessing Air and Water Quality Impacts of Carcass Composting*


Mitloehner: *Effects of Nanobubbles on Methane and other Gases Emissions from Dairy Manure*

Hackmann: *Isolating New Species of Methanogens from the Rumen of Dairy Cattle*

Hess: *Fermented Agricultural Byproducts as Dietary Modulators to Reduce Methane from Cows*



California Priorities Areas Moving Forward



Producing feed with less water

Improving manure N utilization on-farm

Increasing manure N export off-farm

Decreasing methane emissions

Targeted Research: Environmental Management

Addresses Resources and Regulations

Water Quality

Water Quantity

Nutrient Management



Air Quality

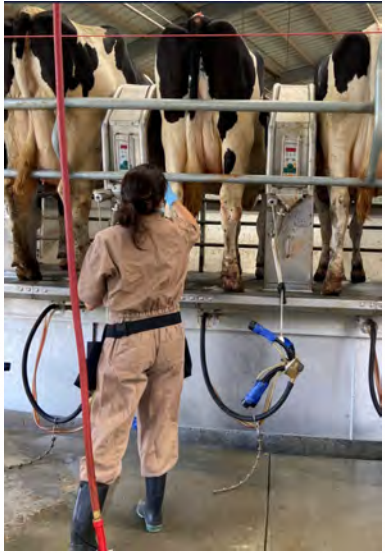
Manure Management

PM & VOC Emissions

Irrigation Management

Greenhouse Gas Emissions

Ensures and Enhances Public Trust



Thank you!



www.cdrf.org



2020 Research Park Dr., Ste 110
Davis, CA 95618





San Joaquin Valley Manureshed Analysis:

*Assessing demand-side opportunities for
surplus dairy manure*

Sarah Castle
Sustainable Conservation

March 2026 MRIP Taskforce Meeting

PATHS FOR EXPORT OF SURPLUS MANURE



- How can we expand use of current solutions?
- How can we catalyze new manure products development?

Talk Outline

01 Results from Manureshed Analysis v1.0

02 Plans for Manureshed Analysis v2.0

03 Questions?

Dairy Manureshed Analysis v1.0



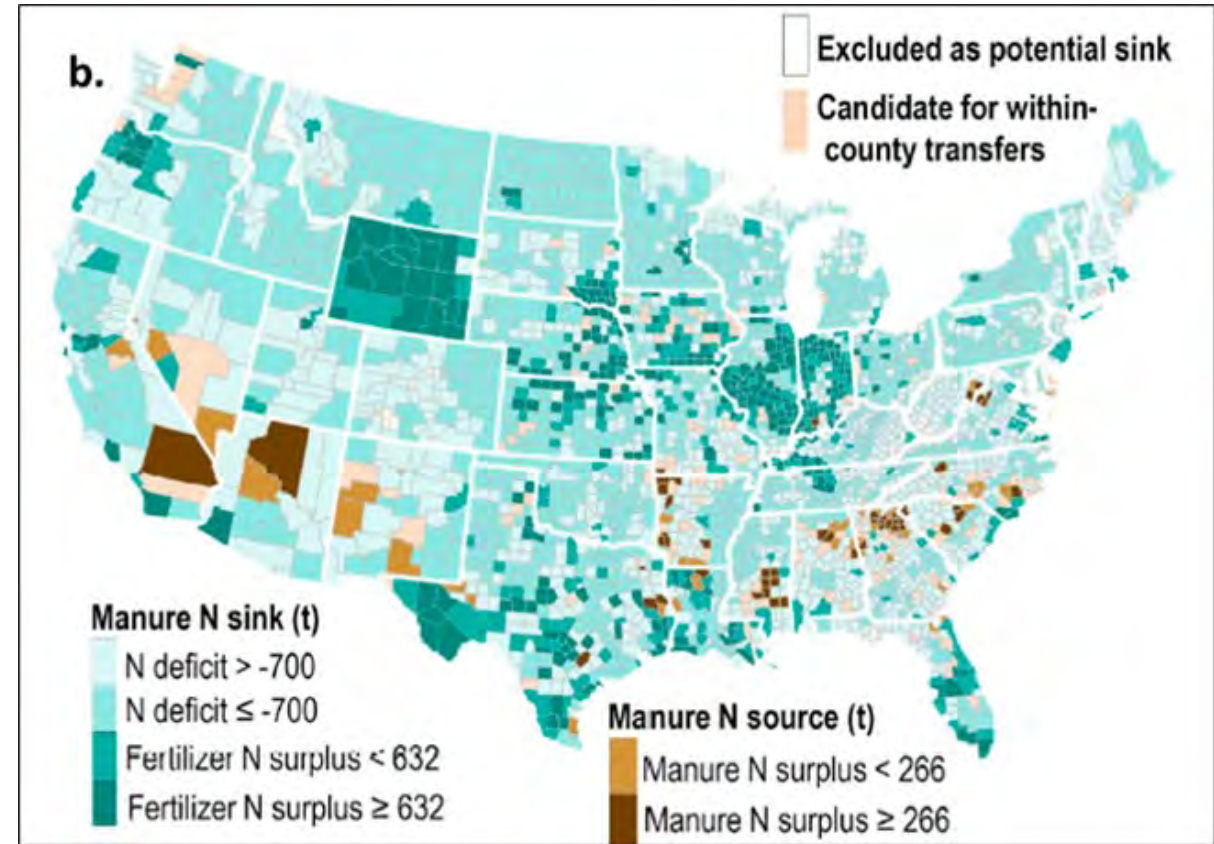
Dr. Emily Waring

Sarah Castle, Ryan Flaherty, John Cardoza (Sustainable Conservation)

'Manureshed'

'Lands surrounding animal feeding operations onto which manure nutrients can be redistributed to meet **environmental, production, & economic goals.**' (Spiegel et al. 2020)

- Identification of Nutrient **Sources** and **Sinks**



Spiegel, et al. 2020

San Joaquin Valley Manureshed Analysis (v1.0)



Objectives

- 01 Identify N sources (dairies) and sinks (irrigated ag) in the SJV, building on previous methodologies
- 02 Identify how much surplus N could theoretically be utilized near SJV dairies, and the value of that N
- 03 Identify which crops are near SJV dairies, and how much surplus N each of those crops could theoretically use

DATA SOURCES

- California Dairy and Livestock Database (CADD) /Air Board
- dairy locations, herd numbers*
- DWR/LandIQ - land use (crop types)*
- FREP fert guidelines, USDA NASS*, published literature

*used 2021 data for Manureshed(1.0) analysis

Potential Plant Available N (PAN) in manure

Methods

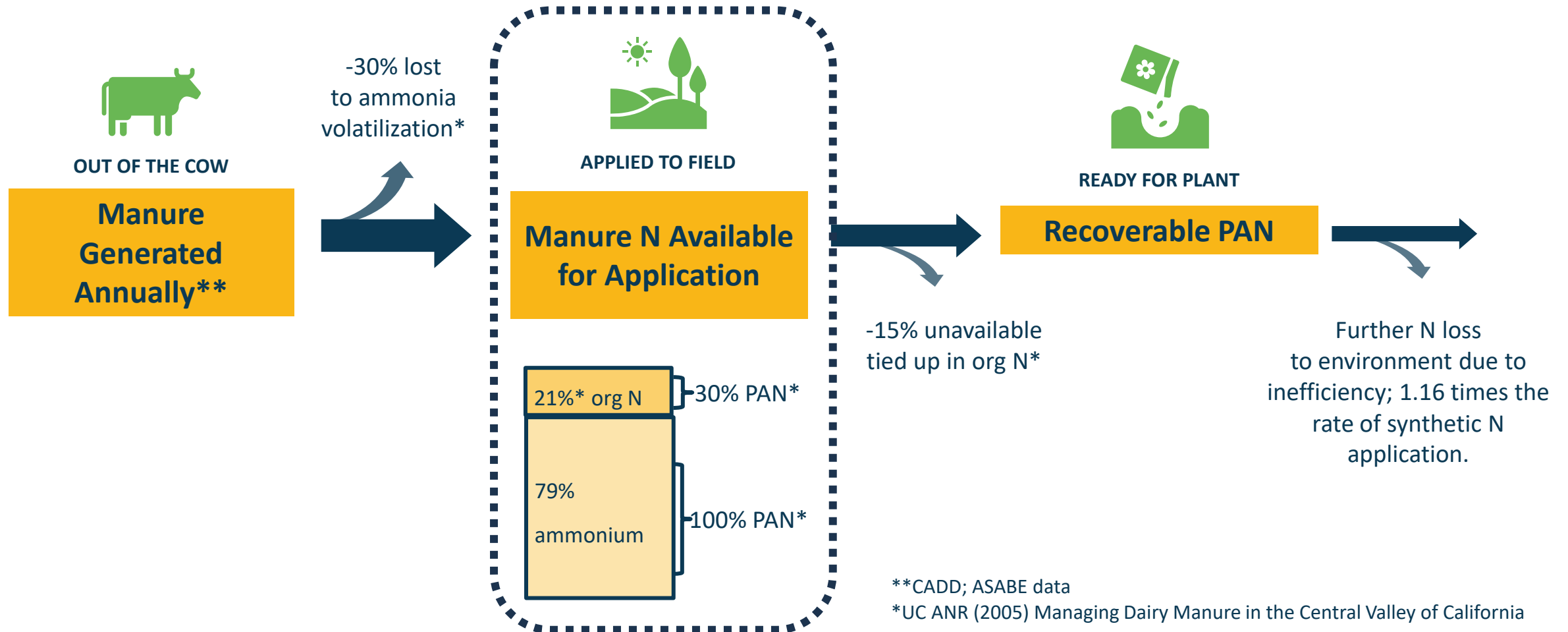


**CADD; ASABE data

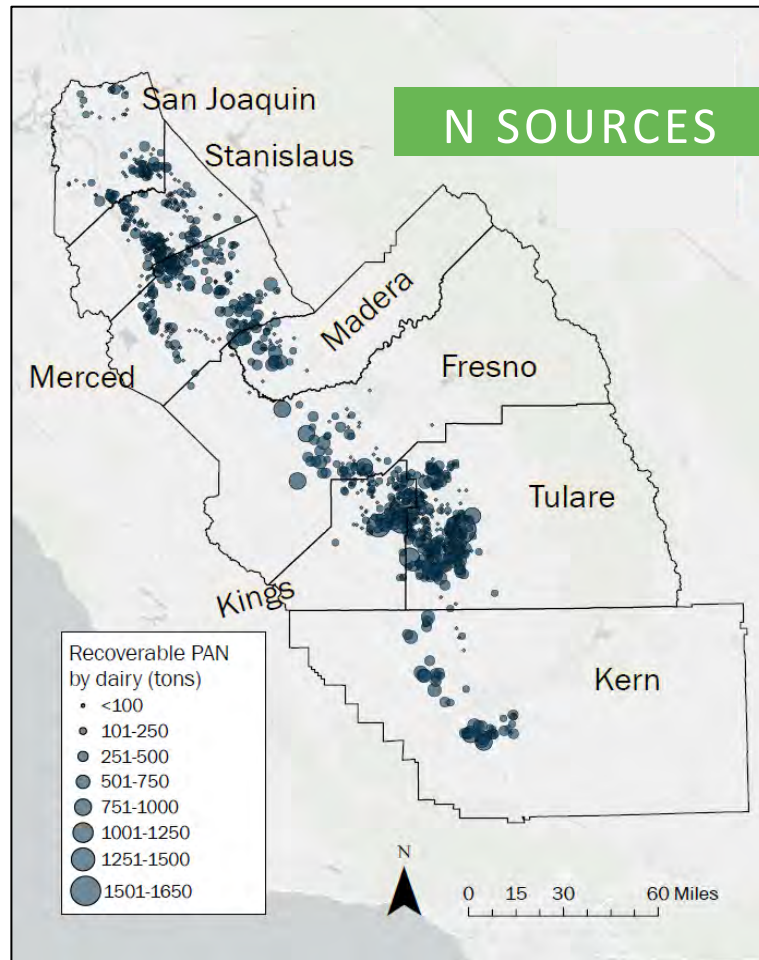
*UC ANR (2005) Managing Dairy Manure in the Central Valley of California

Potential Plant Available N (PAN) in manure

Methods

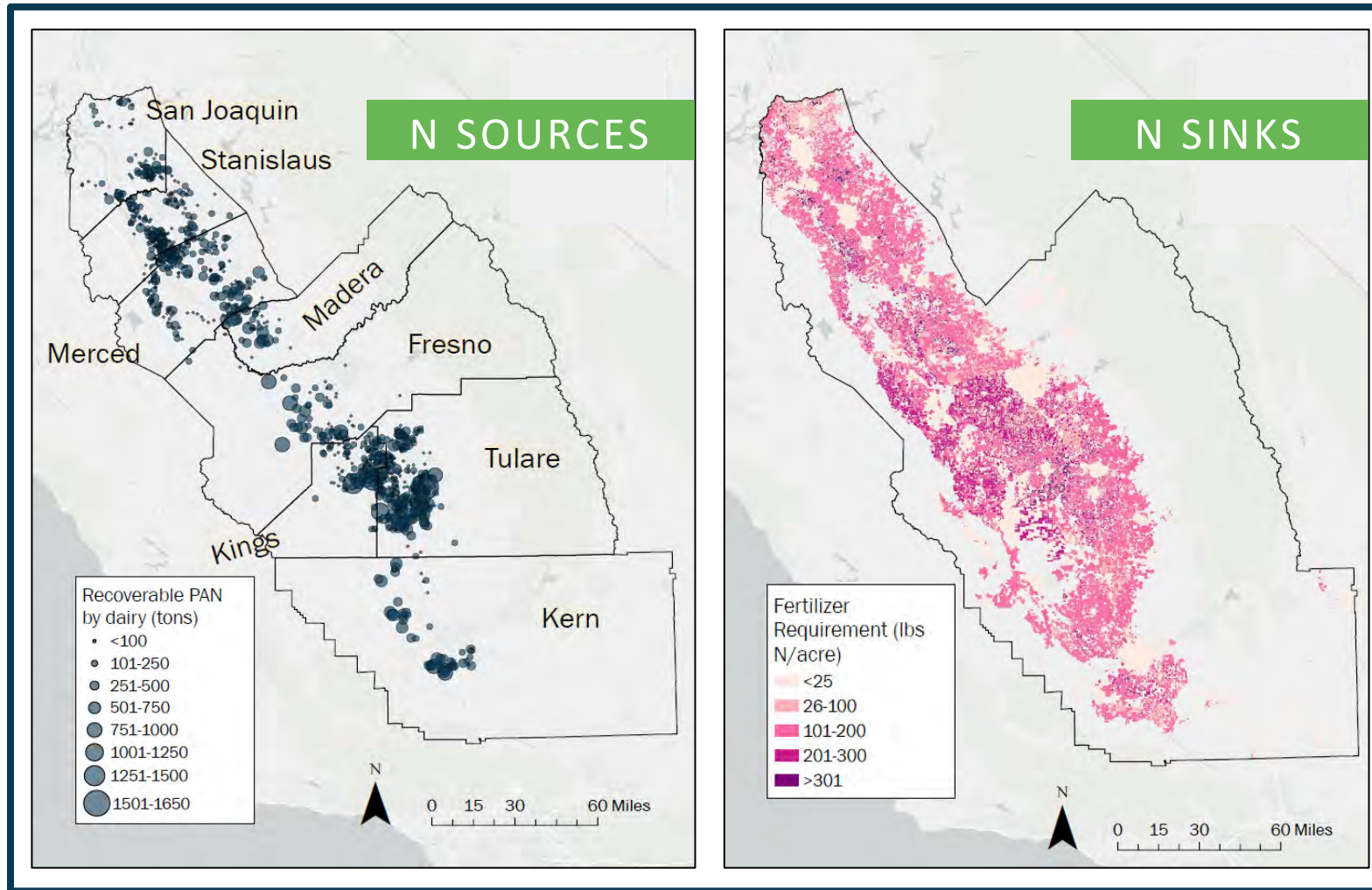


What are the N sources (dairy) & sinks in the SJV?

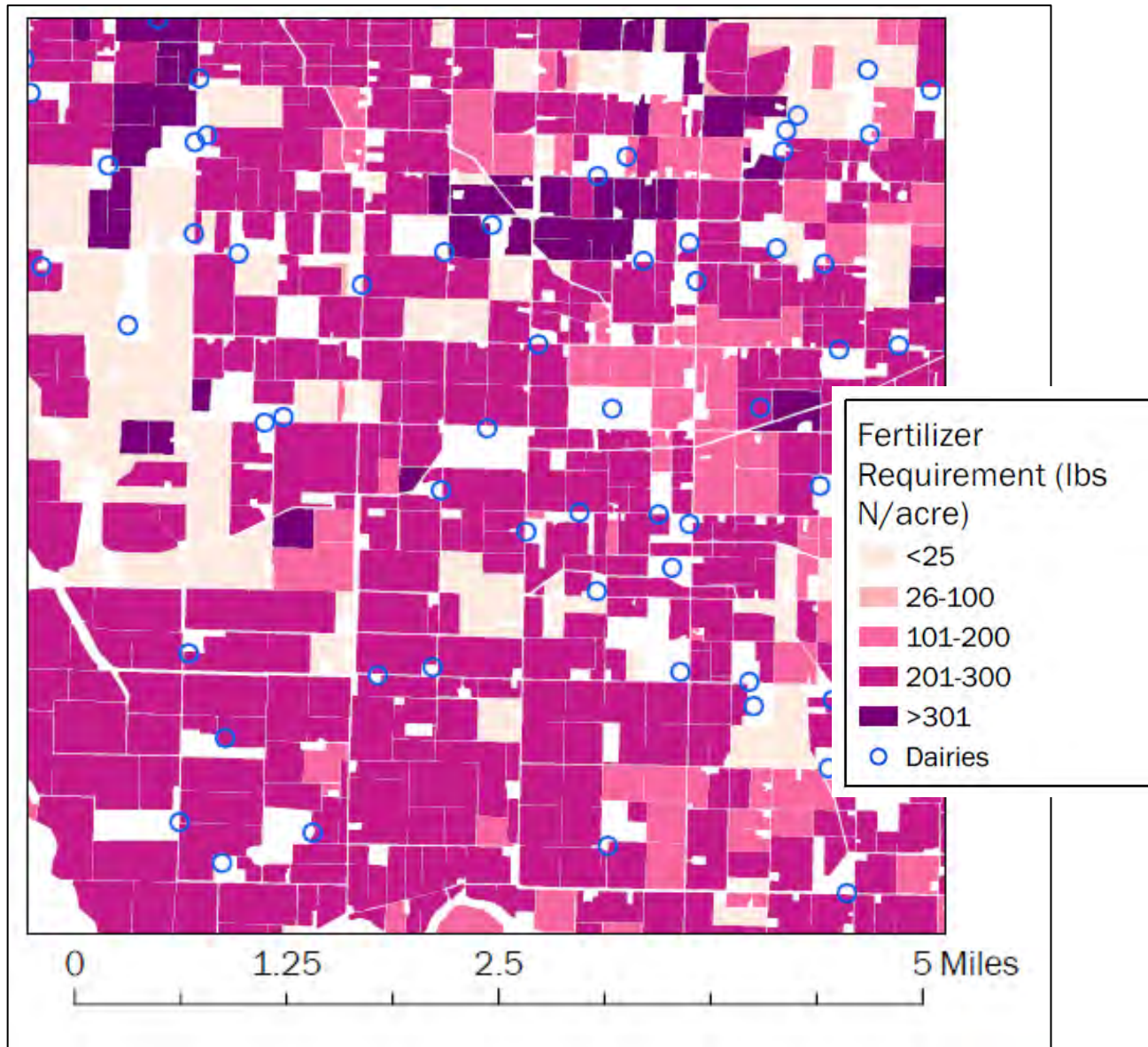


(Sustainable Conservation, in prep)

What are the N sources (dairy) & sinks in the SJV?



(Sustainable Conservation, in prep)

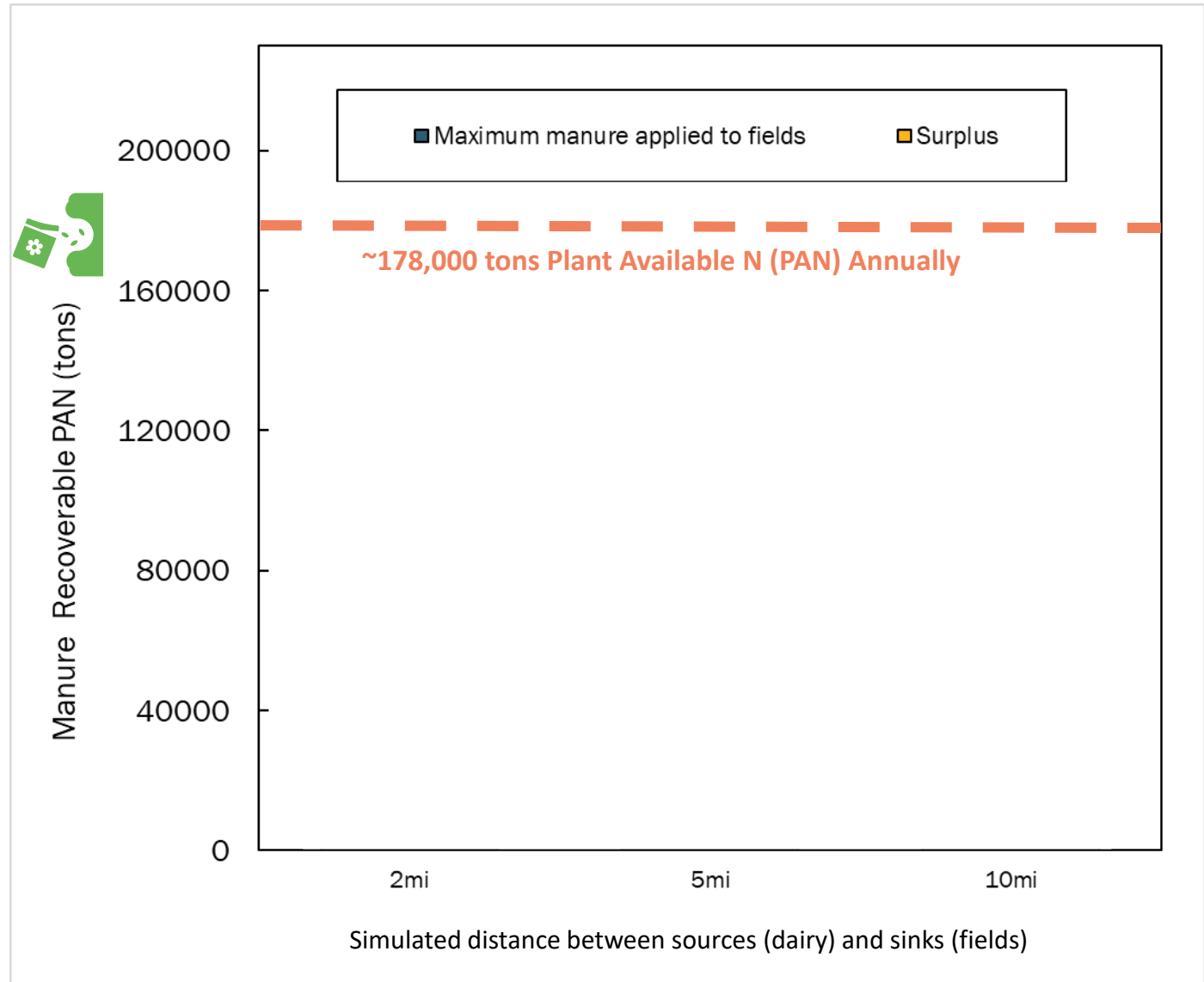


(Sustainable Conservation, in prep)

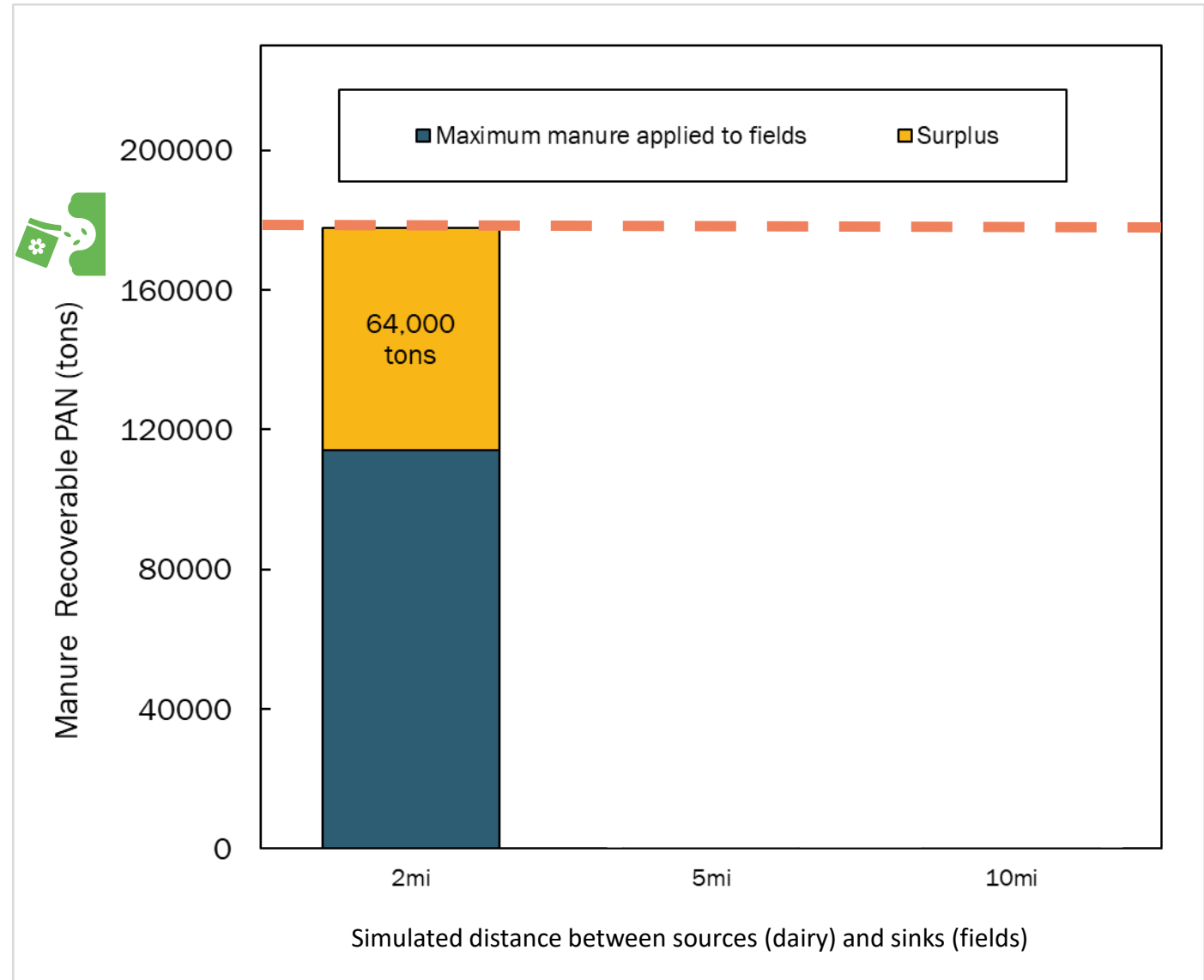
How much surplus N theoretically could be used near SJV dairies?

- Ford-Fulkerson algorithm to maximize the flow between sources (dairies) and sinks (fields)
- Matched dairies with adjacent fields at 2, 5, 10-mile distances

How much surplus N theoretically could be used near SJV dairies?

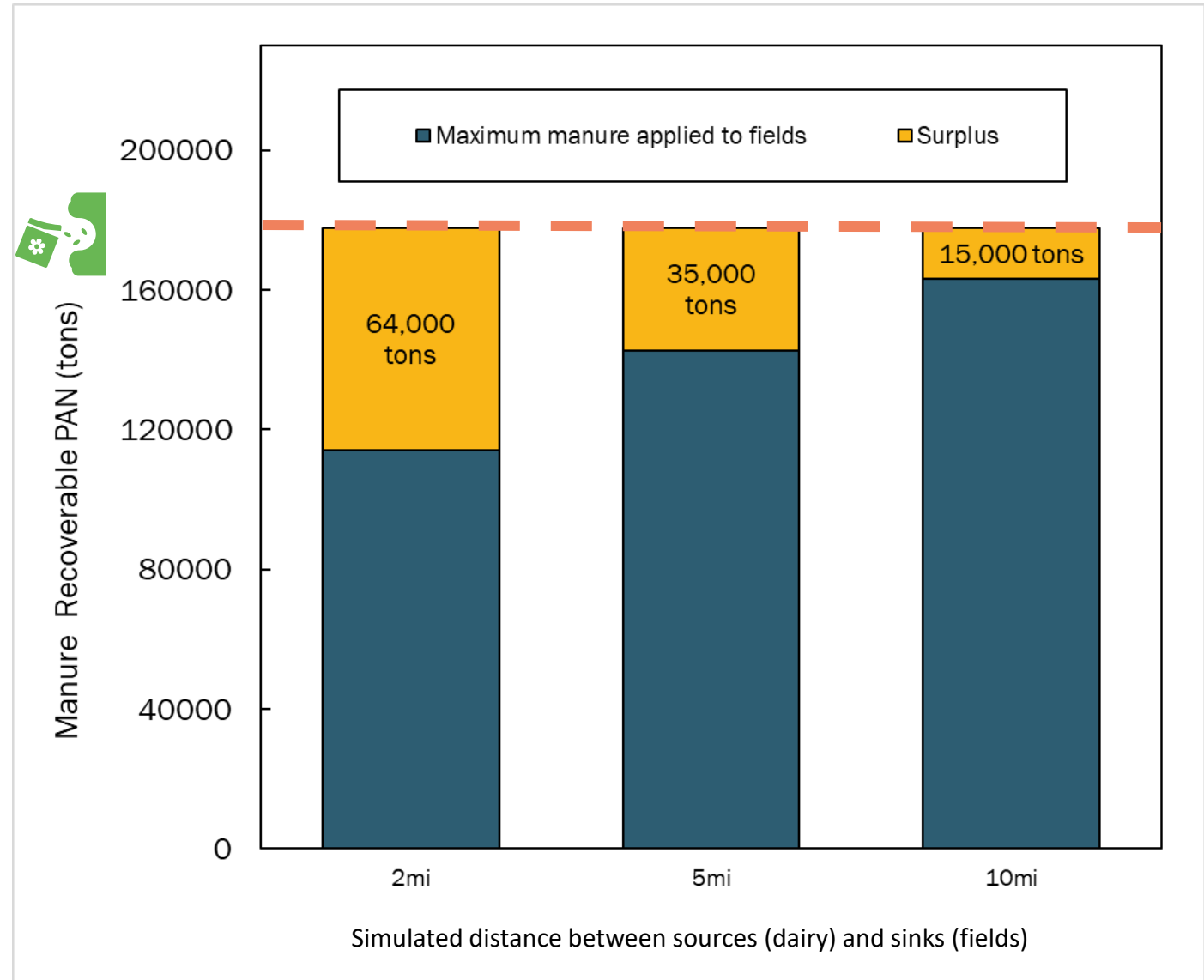


How much surplus N theoretically could be used near SJV dairies?



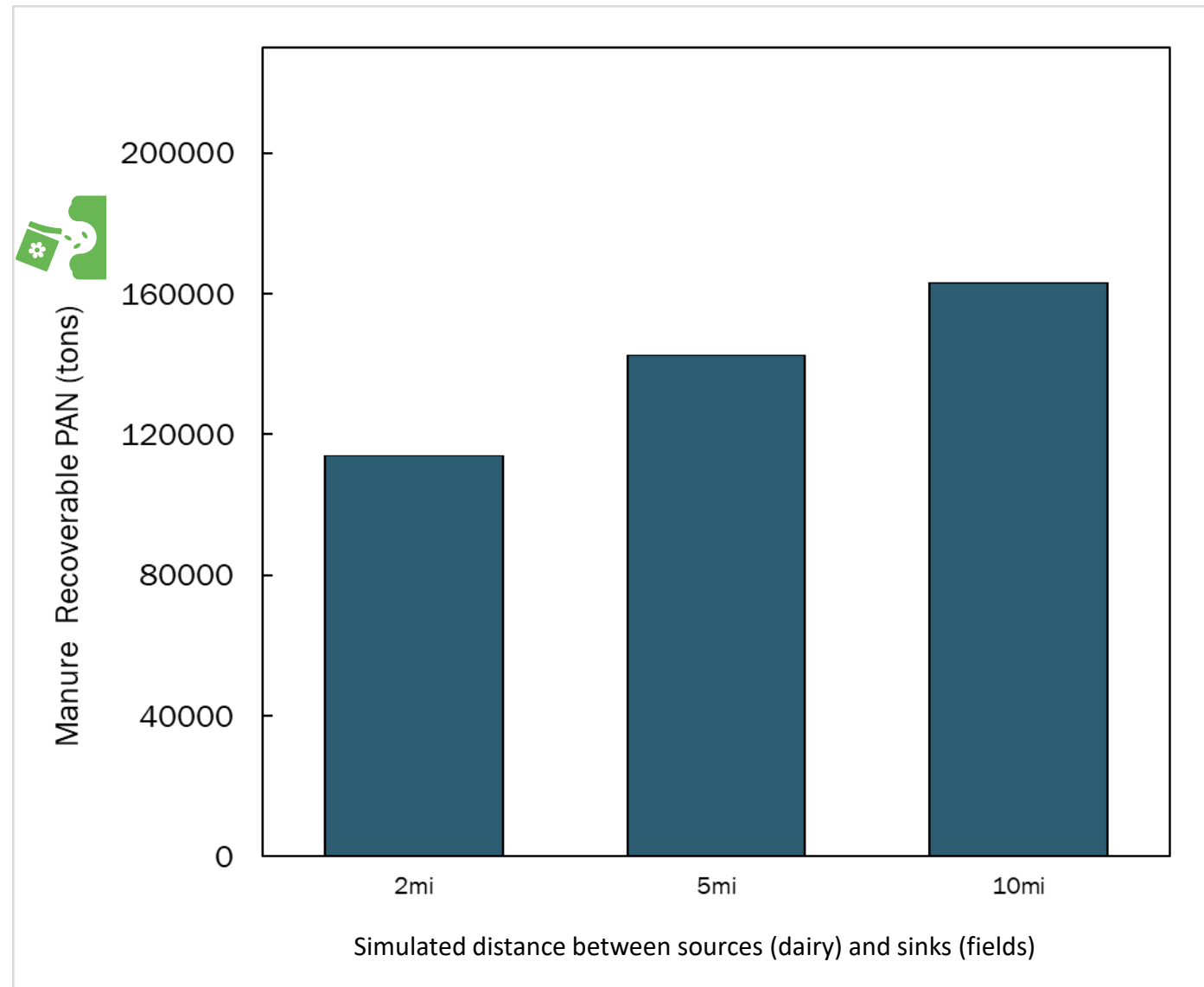
(Sustainable Conservation, in prep)

How much surplus N theoretically could be used near SJV dairies?



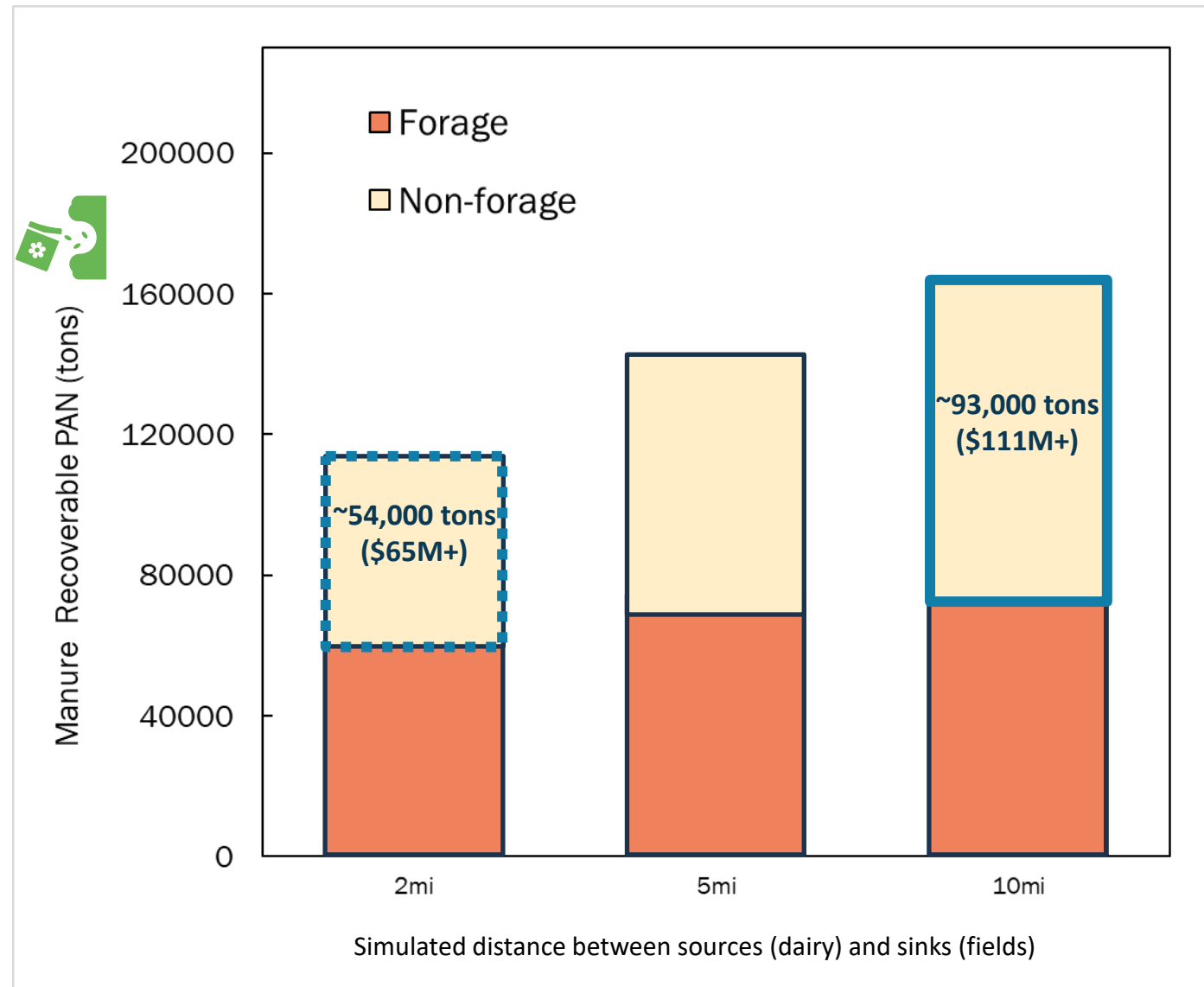
(Sustainable Conservation, in prep)

How much surplus N could go to non-forage crops, and what is the fertilizer-equivalent value?



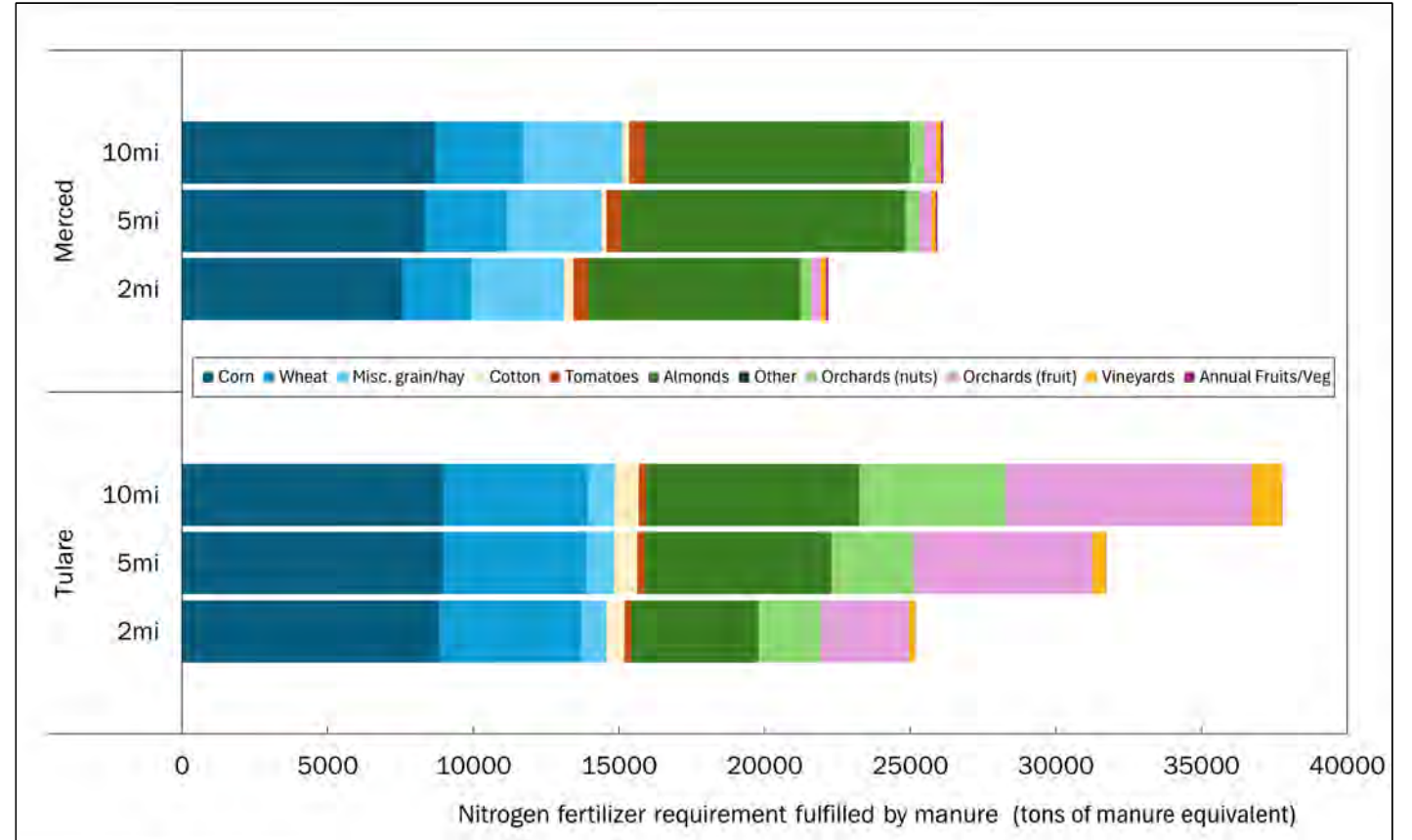
(Sustainable Conservation, in prep)

How much surplus N could go to non-forage crops, and what is the fertilizer-equivalent value?



(Sustainable Conservation, in prep)

Which crops are near SJV dairies, and how much surplus N could they theoretically use?



(Sustainable Conservation, in prep)

San Joaquin Valley Manureshed Analysis (v2.0)



Project Components

- 01 Identify 3-5 promising manure product opportunities, based on needs and preferences of crops near SJV dairies
- 02 Run scenarios using different mixes of products to use surplus N on crops
- 03 Analyze/assess the economic and environmental impacts of those scenarios
- 04 Conduct techno-economic analyses of products to demonstrate what is needed to bring these products to market



Sustainable Conservation

THANK YOU

● QUESTIONS?

Interested in learning more
or supporting Manuresheds
v2.0?

CONTACT US

Sarah Castle

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SJV Office

201 Needham
Modesto, CA

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Meeting Agenda

Recap of MRIP and Vision Moving Forward

Progress on MRIP Goals

Spotlight: Pilot Projects

MRIP-Relevant Regulatory Developments

MRIP-Relevant Research

Discussion: *What Else is Needed to Identify and Scale Solutions for Surplus Manure?*

Closing Remarks

Discussion

What Else is Needed to Identify and Scale Solutions for Surplus Manure?

- What can we do to move forward areas where we haven't made as much progress?
- What are barriers that we can work together to address?
- What has changed since our report that signals the need for new or modified recommendations?
- What opportunities are we missing?

Meeting Agenda

Recap of MRIP and Vision Moving Forward

Progress on MRIP Goals

Spotlight: Pilot Projects

MRIP-Relevant Regulatory Developments

MRIP-Relevant Research

Discussion: What Else is Needed to Identify and Scale Solutions for Surplus Manure?

Closing Remarks

Wrap-up & Next Steps

- Thanks again to our presenters, CDFA and those attending today
- **Between meetings we will:**
 - Continue to follow progress of projects described today and others
 - Receive inquiries and updates from the public
 - Plan another meeting in ~1 year, sooner if needed
- **Between meetings you can:**
 - Go to the website to sign up for meeting notices: www.cdfa.ca.gov/oars/mrip
 - *Contact co-chairs or CDFA staff with updates, opportunities, suggestions for collaboration, ideas for future meetings

THANK YOU!

NAME	ORGANIZATION	EMAIL
J.P. Cativiela (Co-Chair)	Central Valley Dairy Representative Monitoring Program, Dairy Cares	<u>jcativiela@cogentcc.com</u>
Ryan Flaherty (Co-Chair)	Sustainable Conservation	<u>rflaherty@suscon.org</u>
Roberta Franco	California Department of Food and Agriculture	<u>Roberta.franco@cdfa.ca.gov</u>
Alyssa Louie	California Department of Food and Agriculture	<u>Alyssa.louie@cdfa.ca.gov</u>
Dana Brady Yount	California Department of Food and Agriculture	<u>Dana.BradyYount@cdfa.ca.gov</u>

MRIP website: www.cdfa.ca.gov/oars/mrip